

MARCH, 1927

Railway Engineering and Maintenance

A STOP SIGNAL

that's

Always

OBEYED

THE FAIR Rail Anti-Creepers
STOP RAIL CREEPING

THE P. & M. CO.

Chicago

New York

Montreal

Calcutta

London

Sydney

Paris

Large in its relative importance to efficient track maintenance . . .

IN specifying Hy-Crome, railroads no longer think of them as so many "kegs of washers" but rather as individual economic devices capable of performing a definite service for which there is no equivalent.

Hy-Crome Spring Washers are designed to meet demands that actual service tests have proven most essential to sustained rail joint rigidity. They embody a re-active spring action that is non-fatiguing even under repeated compression. This is important, but more important is the fact that they possess "Just enough tension." The relation of this outstanding Hy-Crome characteristic to lower track maintenance is found in necessary free rail movement thereby eliminating battered rail ends, damaged angle bars and broken bolts.




HY-CROME

SPRING WASHERS

THE RELIANCE MFG. CO.

MASSILLON, OHIO

NEW YORK, CLEVELAND, DETROIT, CHICAGO,
ST. LOUIS, SAN FRANCISCO

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W. & A. C. Semple, Louisville, Ky.

Engineering Materials, Ltd., McGill Bldg., Montreal, Quebec, Canada

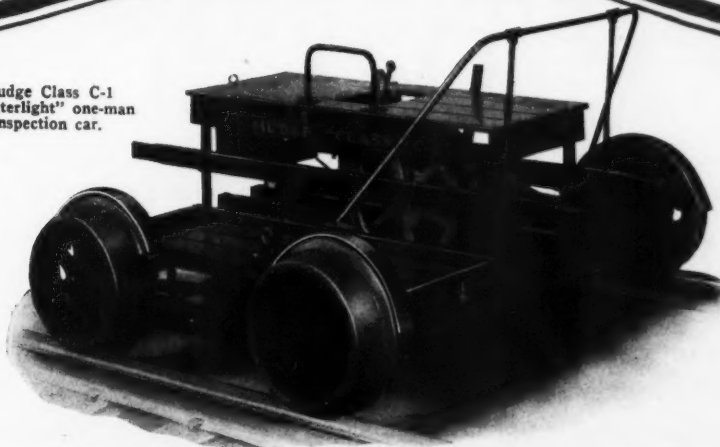
RAILWAY ENGINEERING AND MAINTENANCE

Published monthly by Simmons-Boardman Publishing Co., at 608 S. Dearborn St., Chicago. Subscription price: United States, Canada and Mexico, \$2.00; foreign countries, \$3.00 a year. Single copy, 35 cents. Entered at Chicago, Ill., as second-class matter.

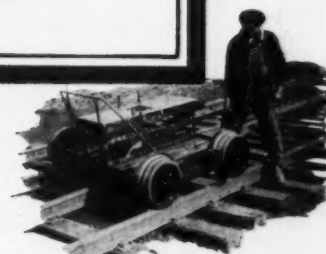
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Classified Index to Advertisers, 90-92

Mudge Class C-1
"Centerlight" one-man
inspection car.



An Achievement!



Weighs less than 400 lbs.

IT is here at last—A center load, one man, free running, air cooled, inspection car, weighing less than 400 pounds, and at the same time meeting the rigid requirements of Mudge construction standards. A product of engineering skill.

The new "CENTERLIGHT" Class C-1 Inspection Car being shown for the first time at the N.R.A.A. Exhibit in Chicago, March 7-10, represents the most outstanding development in light motor car construction of recent years.

See this car and inspect its many practical advantages. Among the many features are

1. Weighs under 400 pounds. Lifting weight 114 pounds.
2. Air cooled, free running, engine with more than double ordinary radiating surface.
3. Imperial Primer for quick starting of engine.
4. Mudge-Bower Roller Bearings on crankshaft and axles.
5. Alemite pressure lubrication on axle bearings.
6. Tilting seat top exposing all working parts.
7. Equalized brakes. Can be locked to hold a car on a grade.
8. Noiseless wood center wheels.
9. Flange fenders.
10. Sliding extension handles both ends of car.
11. Skids for easy removal.
12. Adequate power for grades and strong winds.

Full specifications on request.

See this and other improved models in Booths 146, 147, 127 and 128 at the N.R.A.A. Exhibition.

Mudge & Company

**Manufacturers—Railroad Equipment
Railway Exchange Bldg. • CHICAGO**



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Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

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Published on the last Thursday preceding the date of issue by the

Simmons-Boardman Publishing Company, 608 South Dearborn Street, Chicago, Ill.

EDWARD A. SIMMONS, *President*
L. B. SHERMAN, *Vice-Pres.*

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SAN FRANCISCO: 74 New Montgomery Street

LONDON, England: 34, Victoria St., Westminster, S. W. 1
Cable Address: Uraalimec, London

Entered at the postoffice at Chicago, Ill., as mail matter of the second class.

Request for change of address should reach us two weeks before the date of the issue with which it is to go into effect. It is difficult and often impossible to supply back numbers to replace those undelivered through failure to send advance notice. In sending

us change of address please be sure to send us your old address as well as the new one.

Subscription price in the United States, Canada and Mexico, \$2.00 per year; foreign countries \$3.00. Single copies, 35 cents. Foreign subscriptions may be paid through our London office (34, Victoria Street, S. W. 1) in £-s-d.

Railway Engineering and Maintenance is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulation (A. B. C.)

Reorders Three More for 1927

TO reduce the cost of handling rail and material, one of the large western roads ordered four Parsons Rail Cranes for 1926. The work done by these cranes during the past season has been so satisfactory that another order for three more Rail Cranes has just been placed.

The experience of this road (name and full details on request) is typical of the performance of the Parsons Rail Crane. It not only helps you to get rail laid at lower cost, but it provides an economical method of handling ties and bridge timbers. In addition, it can be equipped with generator or compressor for operating tools, with magnet for handling scrap, and with extra drum for operating a double-line clamshell.

Many roads have already learned that, compared with any other machine of near its capacity, the Parsons Rail Crane is lower in price, and lower in operating cost. It will pay you to get the facts. Write for a free copy of new booklet. "The Modern Way to Handle Rail."

THE PARSONS CO.
Newton, Iowa.

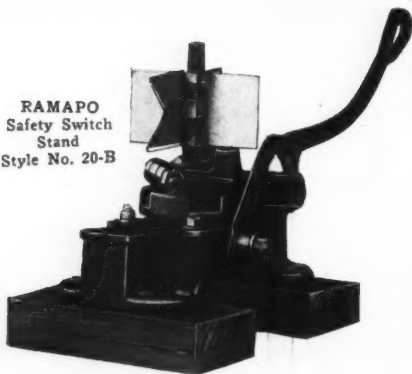


Taking Rail Onto a Trestle—Note how the Parson's system of counterweighting permits moving the Rail Crane under load.

PARSONS RAIL CRANE

Lowers the cost of handling rail and material

RAMAPO
Safety Switch
Stand
Style No. 20-B



GREATER SAFETY THROUGHOUT THE SYSTEM

RAMAPO Automatic Safety Switch Stands assure safety under all conditions. They are as troubleproof as years of experience can make them. They not only perform their function of throwing the switch but also increase the efficiency of the trackman. He is able to give more time and attention to his other duties—*resulting in greater safety throughout the entire system.*

A coil spring has been introduced in the 20-B Stand to maintain the stability of the horizontal lever. This improves the action so that when the horizontal lever goes into its latched position it does so with a snap. The operator is thereby emphatically notified that the stand is fully thrown and latched.

Send for full details.


MAIN OFFICE-HILLBURN, NEW YORK

Sales Offices at
30 CHURCH ST. New York
and at

RAMAPO-AJAX-ELLIOT WORKS

Hillburn, New York	Pueblo, Colorado
Niagara Falls, New York	Superior, Wisconsin
Chicago, Illinois	Los Angeles, Cal.
East St. Louis, Ill.	Niagara Falls, Canada

RAMAPO AJAX CORPORATION



PRODUCTS

HEAVY DUTY HEAT
TREATED GUARD
RAIL CLAMPS

DROP FORGED RAIL
BRACES

ADJUSTABLE RAIL
BRACES

EUREKA
ADJUSTABLE CLIPS

MANGANESE
REINFORCED
SWITCH POINTS

RAMAPO AUTOMATIC
SAFETY SWITCH
STANDS

AJAX MANGANESE
ONE-PIECE
GUARD RAILS

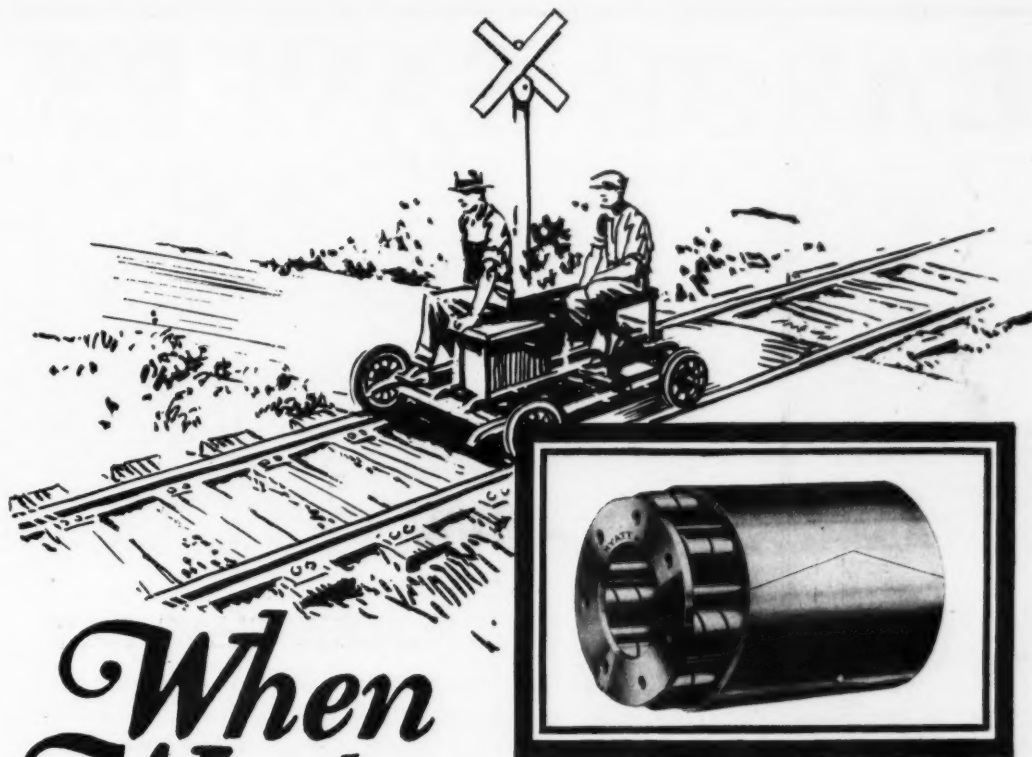
HERCULES RAIL
EXPANDERS

SWITCHES—FROGS

CROSSINGS

SPECIAL RAILWAY
TRACK
WORK





When Winter goes...

Your roadbeds need attention. New repair jobs crop up constantly. The maintenance cars must be in good condition. And condition is largely dependent upon one important factor—the car bearings.

Which emphasizes the need for Hyatt Roller Bearings in all maintenance car equipment. Hyatts, with their easy rolling motion, are practically frictionless and wear-proof. They carry heavier loads over

the miles and years on less power.

The greatest gain, of course, comes from increased endurance—permanent freedom from breakdown and delays. Hyatts need no repairs or replacements. The only attention they need is three or four lubrications a year.

Leading builders of cars furnish Hyatt Roller Bearing equipment for steady, consistent performance—specify them.

HYATT ROLLER BEARING COMPANY

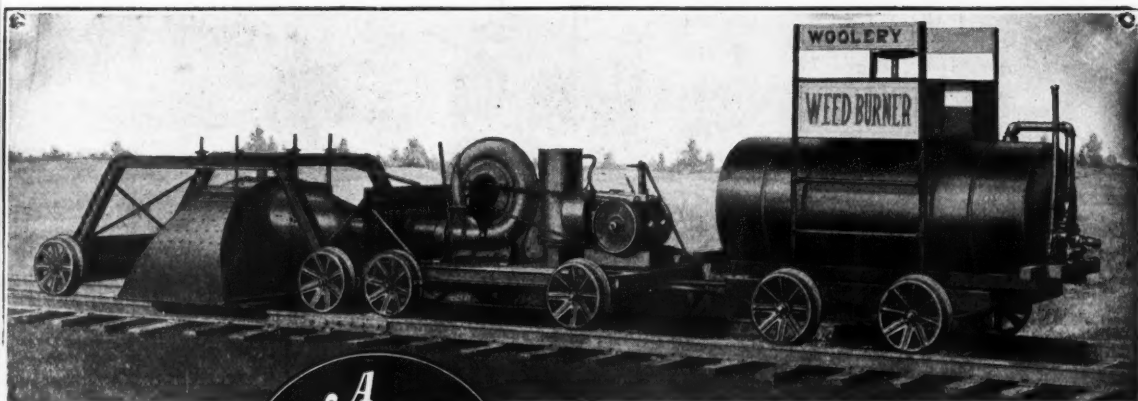
Newark	Detroit	Chicago	Pittsburgh
Worcester	Philadelphia	Oakland	
	Cleveland		

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

LABOR SAVERS



Patent Allowed

*A
Two-Man
Outfit
of Guaranteed Efficiency
Average cost on first heavy burning
less than
\$3.00 per
mile*

FLAMES THAT PAY

The greatest losses in the United States every year are caused by fire. Likewise the greatest saving in track maintenance costs on American Railroads the past three years have been due to fires—i.e. flames produced and controlled by Woolery Weed Burners. Many

thousand miles of track cleaned by this equipment at the lowest cost ever achieved for this work prove that flames do pay. By the use of the new side burning attachment a total width of 30 feet may be burned.

Clean track with Flames instead of hand labor and save 30 to 60% of present costs.

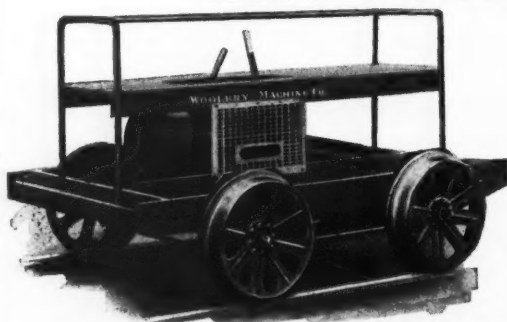
Investigate **now** for this year's savings.

NEW POWER BOLT TIGHTENER

On exhibit for the first time at the March Show. Does the work of 5 men and does it better.

Tightens Bolts uniformly to any predetermined tension. Can be rolled off the track by 1 man in 20 seconds. Drills holes up to 12 inches and does it fast.

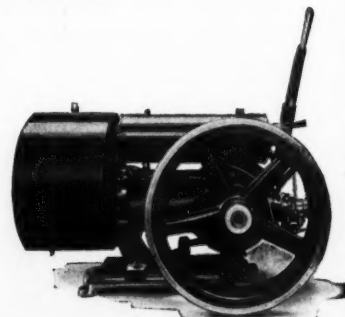
RAILWAY MOTOR CARS AND ENGINES



RAIL LAYER
ATTACHMENTS

TIE SCORING
MACHINES

See Our Exhibit
Coliseum
March 7-10
Spaces 232-233



WOOLERY MACHINE CO.

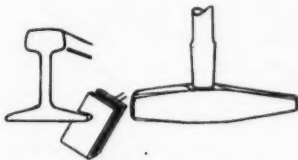
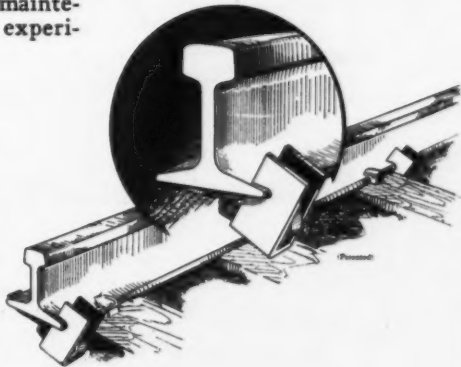
Minneapolis, Minn.

TRUE TEMPER APPLIANCES

are the result of years of study by some of the best track maintenance men, and are made by skilled craftsmen, with a long experience in rolling and treating steel products.

"STEAD" TRUE TEMPER RAIL ANCHORS

No excavation or removal of ballast is necessary to adjust and lock this anchor into place. The tension of the locking spring-key is sufficient to take up the shock and wear of service while holding the clamp firmly in place against the tremendous face pressure and tilting action.



Place clamp on the gauge side of the rail base—tight against the tie. Tap until the jaws make a snug fit on the rail base as shown in picture.



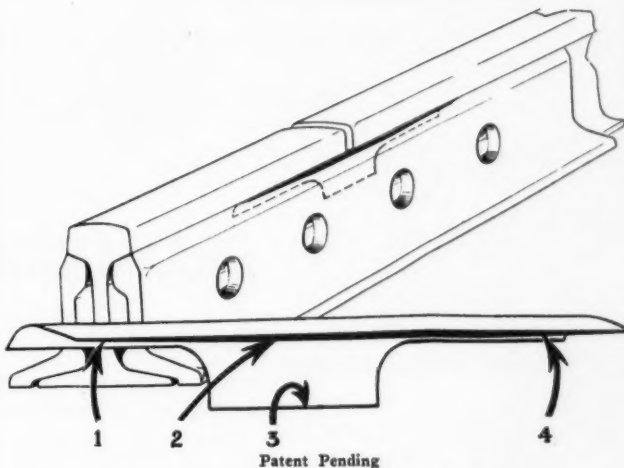
Insert the spring "key" through the clamp as far as it will go.



When spring "key" wedges in the clamp with a light blow, it is ready for locking.



Drive the spring "key" home with a heavy blow of the spike maul. It then seats firmly in the clamp and locks on the opposite side of the rail base.



Patent Pending

TRUE TEMPER TAPERED RAIL JOINT SHIM

A simple, inexpensive remedy for Loose Plates—Broken Joints—Costly Maintenance.

The True Temper Shim provides an oil tempered bearing between rail head and joint plate—exactly where the greatest amount of wear takes place. It is designed to fill the worn space, which is greatest at the place where the rail ends meet and decreases outward.

1. Ends of minimum thickness for practical service.
2. Thickest at the center where the greatest wear takes place.
3. Wider between center bolts to hold shim firmly in place.
4. Gradual taper from center to ends to replace metal worn away in service.

Made by

THE AMERICAN FORK & HOE COMPANY

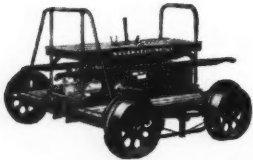
Railway Appliances Division

General Offices
Cleveland, Ohio

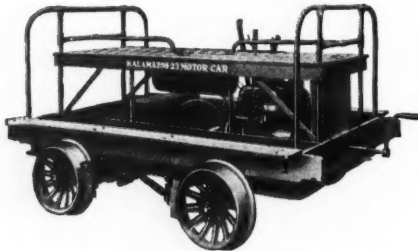
Factory,
North Girard, Pa.

From Midgets To

And All Sizes
In Between



Kalamazoo "16-L" This car is strictly one-man in operation, but provides ample room for two men to ride comfortably.



Kalamazoo "23" A powerful two-cylinder steel frame section motor car seating 8 to 10 men. Plenty of power for hauling loaded trailers.



Kalamazoo "25A" A four-cylinder car for extra gang service. Seats 12 men and hauls large loads on trailers.

Kalamazoo "25A" Hump Car for extra-large gang and hump yard service. Seats 24 men and easily hauls many more on loaded trailers.

No matter what your motor car requirements are, you'll always find a Kalamazoo car to meet them.

Kalamazoo Motor Cars are built in seven distinct sizes, ranging from the midget-like 2-passenger "16-L" to the giant 30-passenger "35."

Through their ability to fill your every requirement, Kalamazoo make it possible for you to standardize on one line of motor cars, built with uniform excellence—each car giving you the same never-failing dependable service.

"Kalamazoo Means Service to You"

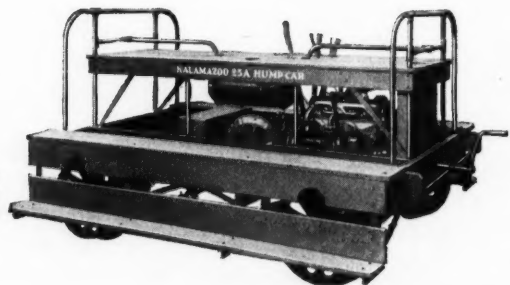
When at the March Convention, call on us at spaces 8, 8½, 23, 24, and 25.

KALAMAZOO RAILWAY

Established 1884

Kalamazoo

New York, Chicago, St. Louis, St. Paul, New Orleans,
Portland, Ore., Havana, London, Mexico City, Johannesburg,
Montreal



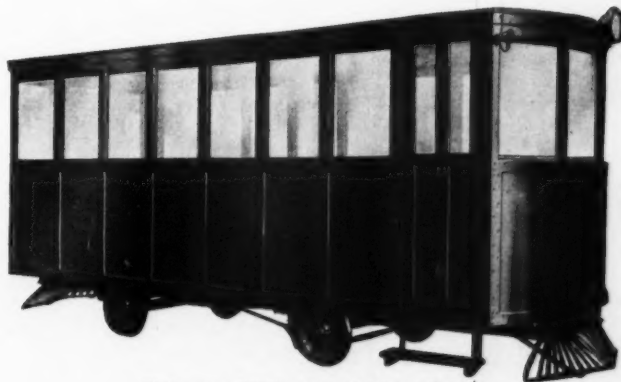
GIANTS

THE KALAMAZOO LINE

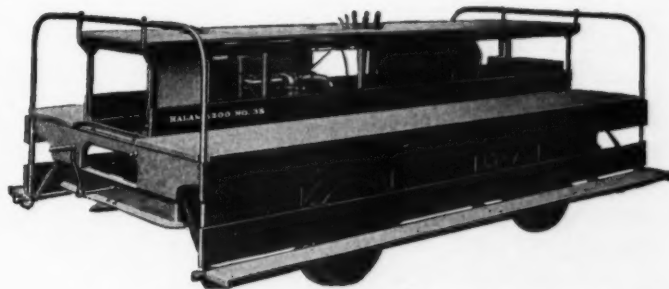
What It Means to You

The name **Kalamazoo** on any product has been a guarantee of quality for more than forty years. From time to time, as rigorous tests proved them worthy, various products were added to our line until it is now one of the world's largest lines of railway maintenance of way equipment.

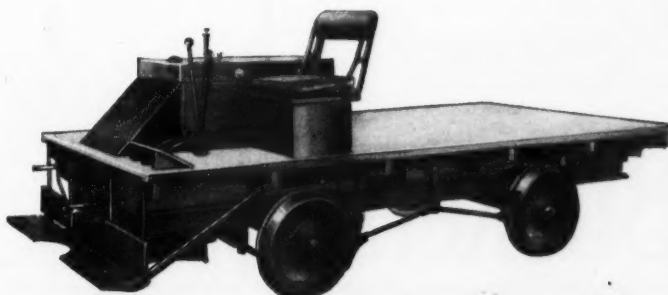
KALAMAZOO



Kalamazoo "355" A completely enclosed, all-weather Coach-Type Body seating 22 men. Double-end control and operation.



Kalamazoo "35" A tremendously powerful car for extra gang, hump yard or bridge gang service. Standard body seats 30 men.



Kalamazoo "35B" A flat-decked work car mounted on the rugged "35" chassis. Extensively used in place of a locomotive and train crew in hauling men and materials to the job.

RAILWAY SUPPLY CO.

lished 1884

Michigan

Paul, New Orleans, Denver, Spokane, Seattle,
exico City, Johannesburg, Vancouver, Winnipeg,
Montreal



Making easy work of ash removal

Hayward Buckets save time for many roads in clearing ash pits at terminals. They make ash removal an easy job.

With Haywards in action, it is possible to confine fire cleaning to a smaller portion of the track. A Hayward works rapidly and grabs big loads to make the pit ready for succeeding groups of engines.

This is but one of many railroad jobs in which Haywards are serving. Let experienced Hayward engineers help you to get a bucket to the job.

THE HAYWARD COMPANY

46 Dey Street

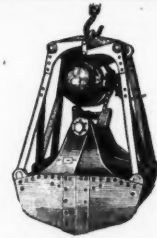
New York, N. Y.

Builders of Clam Shell, Drag Line, Orange Peel and Electric Motor Buckets; Dredging, excavating, and Coal

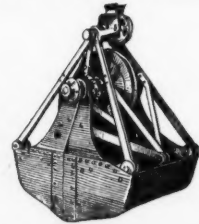


Handling Machinery, Automatic Take-Up Reels; Counterweight Drums.

Hayward Buckets



Electric Motor Buckets



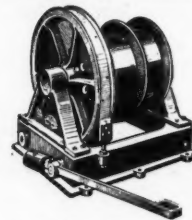
Clam Shell Buckets



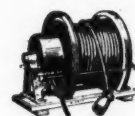
Orange Peel Buckets



Drag Scraper Buckets



Counterweight Drums



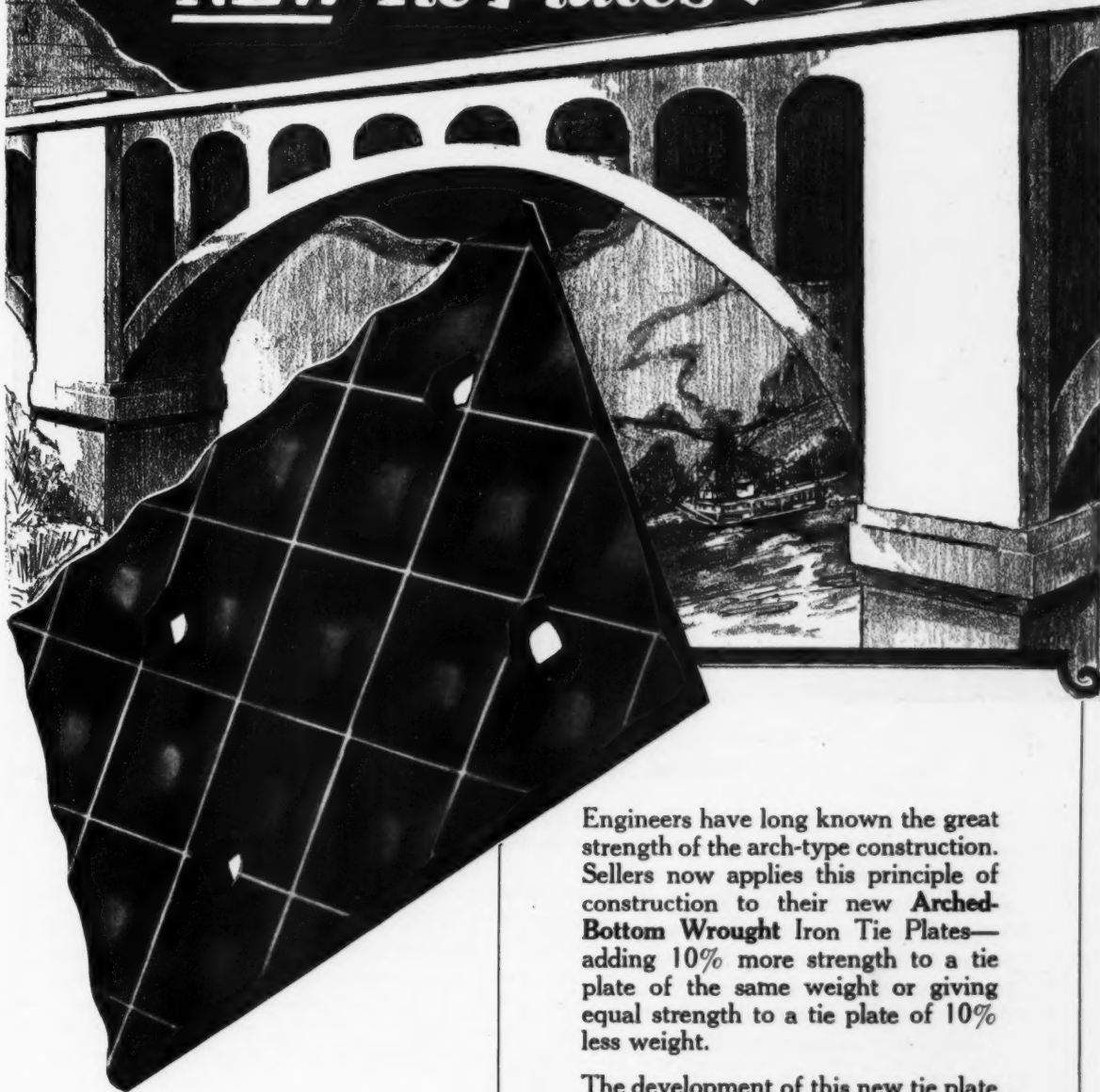
Automatic Take-Up Reels



Skid Excavators and Dredges

SELLERS

*Applies an Engineering
Principle of Strength to Their
NEW Tie Plates*



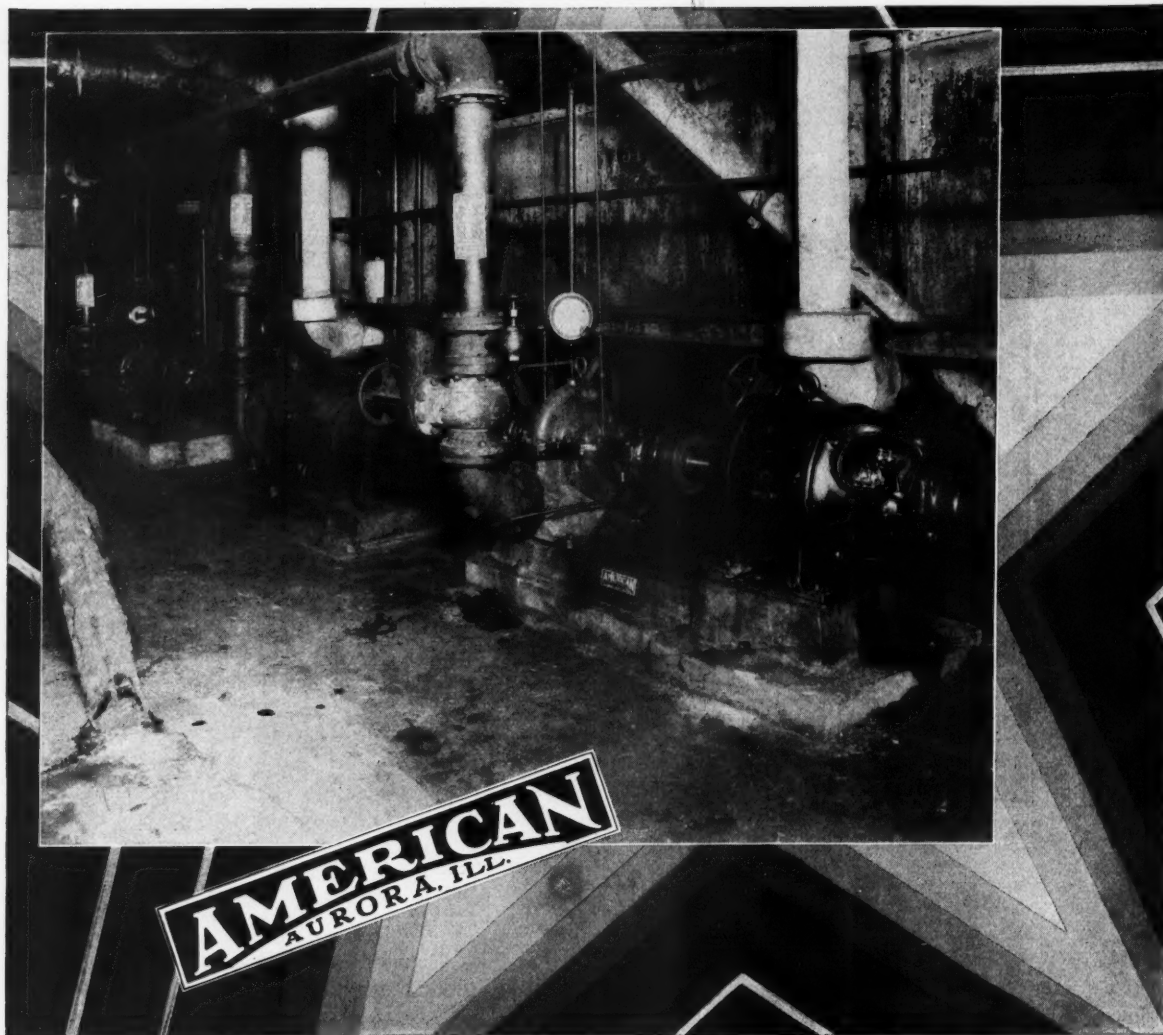
Engineers have long known the great strength of the arch-type construction. Sellers now applies this principle of construction to their new **Arched-Bottom Wrought Iron Tie Plates**—adding 10% more strength to a tie plate of the same weight or giving equal strength to a tie plate of 10% less weight.

The development of this new tie plate is the result of Sellers' fifty years of manufacturing experience.

Sellers Manufacturing Co.

Illinois Merchants Bank Bldg.

Chicago, Illinois



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Dallas, Texas,
820 Fidelity
Union Bldg.

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Calif.
635 Mission St.

Los Angeles,
Calif.
520 E. Third St.

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Kansas City, Mo.
St. Paul Minn.
Cleveland, Ohio

National Sugar Refining Company Uses "American" Pumps

PICTURED above is an installation of American Well Works pumps in one of the plants of the National Sugar Refining Company.

Many of the largest industries of this country use pumps bearing the nameplate of the American Well Works throughout their plants. The efficient handling of liquids in the complicated industrial processes of today demands pumps that are unusually simple in construction, steadfast and powerful in operation. As they are built to the specifications of engineers to meet particular requirements of industrial usage, it is but natural to expect unusual quality and performance from American Well Works pumps.

To aid you in specifying and selecting pumping equipment, the advice of a group of "American" engineers who are thoroughly conversant with industrial practices is at your disposal.

THE AMERICAN WELL WORKS

General Offices AURORA, ILLINOIS and Factory



ELECTRIC TIE TAMPING

A REAL LABOR SAVER

Ballast tamped with Jackson Electric Tie Tampers, due to their rapid, vibratory blows instead of the heavy pick type direct blows, is not jammed along under the edge of the tie, leaving hidden voids, nor is the ballast pulverized, but is compacted into place from 8 to 12 inches ahead of the tamping bars.

The result is a compact mass completely filling up underneath the tie that insures more uniformity and longer life than where tamped by the usual method.

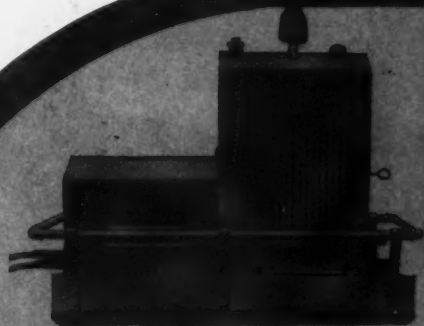
During the past 7 years, more than 50 of the leading railroads have found Jackson Electric Tie Tampers both economical and real cost reducing devices.

Power Plants are built in sizes to operate 4, 8 or 12 tamping units.

Aside from operating the Jackson Electric Tie Tampers, the Power Plants can be used for operating electric saws, drills, grinders and other electric track tools, and with compressors for painting equipment and sand blasting.

Also adaptable for use with flood light systems.

See our Exhibit at Booth Nos. 204 and 211 at the Coliseum, or send for our latest bulletin.



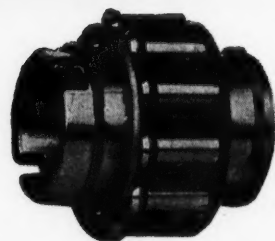
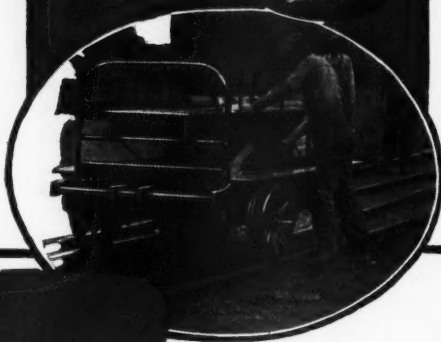
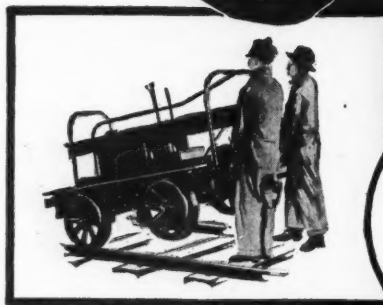
ELECTRIC TAMPER & EQUIPMENT CO.

RAILWAY EXCHANGE BUILDING

CHICAGO, ILL.



A2
Advance
Section
Car



SAF

RAILWAY

ETY

in More Ways Than One

- 1—High Safety Rails at each end. Center Grab Rail makes men in center as safe as those at both ends.
- 2—Quick stopping, adjustable four-wheel brake controlled by centrally located lever which cannot be blocked by tools.
- 3—Started by cranking—no pushing followed by a sudden start and dangerous scrambling to get on.
- 4—Deep tool trays on each side securely hold longest track tools.
- 5—Reversible engine gives choice of setting-off places.
- 6—Lift pipes and light engine make removal from track easy.
- 7—RINGSEALD Roller Bearings cannot cut the axle.
- 8—Safer wheels—press fit, non-corrugated hubs—rivets stay tight.

FAIRMONT RAILWAY MOTORS, Inc.
FAIRMONT, MINNESOTA

District Sales Offices

NEW YORK
WASHINGTON, D. C.

CHICAGO

NEW ORLEANS

ST. LOUIS

SAN FRANCISCO
WINNIPEG, CANADA

BALDWIN LOCOMOTIVE WORKS, Foreign Representatives

**FAIRMONT
RAILWAY
MOTOR CARS**

Inspection—M19

Light Section—M14

Section { A2
M2
S2

**Performance
on the Job
Counts**

mont

MOTOR CARS

Genuine Labor Saving Ties!



They Reduce Tie Renewals

\$200,000,000 is being spent annually for tie renewals. Close scrutiny of so great an expenditure is vital.

The purchase of low priced, short-lived ties is not economical because annual renewals remain high and the labor cost continues to rise.

Sound, full size, well seasoned and scientifically treated ties are necessary for greatest economy and dependability even though

they cost slightly more than sub-standard ties.

It costs just as much to handle, treat and insert a poor tie as it does a good one. But the poor one will last only 6 to 7 years. The good one will last 20 years or more.

International ties are quality ties—they are labor saving ties, their cost per year is lower and they assure a sound track structure.

Place contract for International Ties for future delivery.

International Creosoting & Construction Co.

General Office—Galveston, Texas

International

STANDARD SPECIFICATION TIES

Safety

The DIFFERENTIAL DOUBLE FULCRUM AIR DUMP CAR

is the most important development in dump car design since the birth of the dump car, and it is the only new principle relating to dump cars that has been evolved in many years.

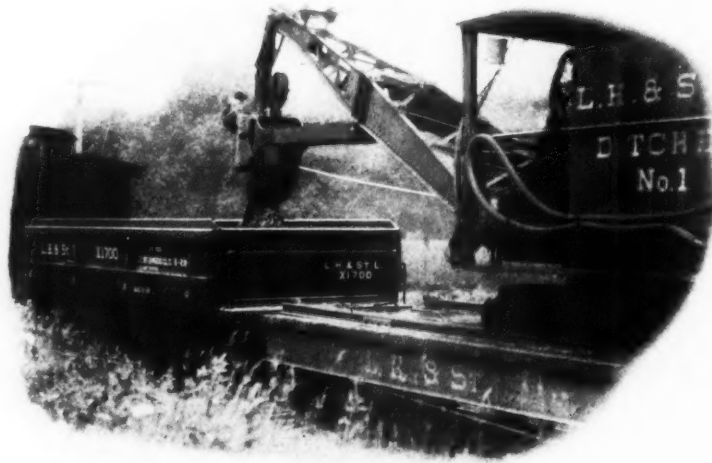


THE REMARKABLE FACT IS THAT THE DOUBLE FULCRUM DESIGN GIVES NEARLY EVERY FEATURE FOR WHICH DUMP CAR OPERATORS HAVE BEEN SEEKING FOR MANY YEARS. AND IT GIVES EACH AND EVERY ONE OF THESE MANY FEATURES IN A FASHION SUPERIOR TO ANY SIMILAR FEATURE ON OTHER CARS.

Bulletin D20

The Safety Feature of the Differential Double Fulcrum Car is, alone, enough to warrant its adoption.

Low Height



DIFFERENTIAL *Double Fulcrum* AIR DUMP CARS

THE Double Fulcrum principle allows the body in its normal position to rest directly over the bolster side bearings.

Therefore the car gives much the same appearance as a gondola and is just as stable. Contrast this method of support with the old center supported type car with its body high in the air and with the swaying and rocking which naturally comes from a body held in unstable equilibrium! The Differential Double

Fulcrum Air Dump Car is much lower than any other Air Dump Car of the same capacity. It is extremely easy to load and renders itself particularly easy to operate in connection with the ditcher. This low height with its attendant advantages of stability, easy loading, absence of locking mechanism, etc., was made possible only by the double fulcrum design which was conceived and developed by the Differential Steel Car Company.



The low height, alone, of the Differential Double Fulcrum Car, with its resulting stability, impels its adoption.

Dumps far from track

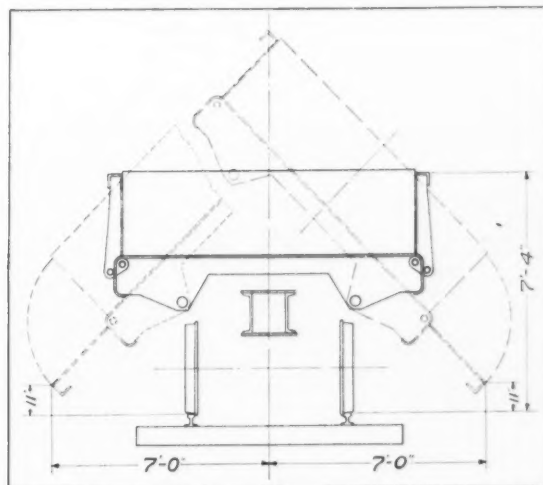
DIFFERENTIAL

Double Fulcrum

AIR DUMP CARS

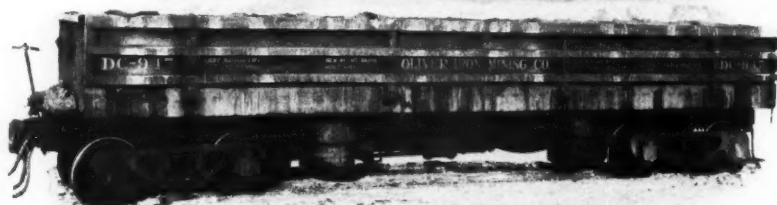
THE car, in dumping, revolves its body around a point approximately over the gauge line on the dumping side (see drawing below). During the tilting operation the side of the body folds down, which chutes the material still further away from the track. This combination of the down-folding door and the side hinging of the body over the gauge line gives an extraordinary distance that the load is cast away from the track. While there is a definite whip or throw to the

body during the dumping operation, there is practically no suggestion of shock which is quite noticeable in other cars and which would tend to destroy track structures, trestles, and even damage the car itself. In ditching service or dumping over wide fills, this extra distance obtained by the Differential Double Fulcrum Air Dump Car is well worth while. It protects the ballast and cuts down the labor and in most cases the use of a spreader is unnecessary.



The labor saved by the extra distance the Differential Double Fulcrum Car casts its load away from the track, considered alone, makes its adoption an economic necessity.

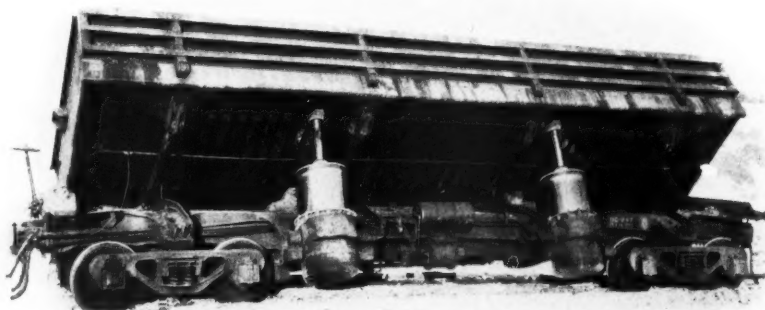
Simplicity - Ruggedness - Long Life



DIFFERENTIAL *Double Fulcrum* AIR DUMP CARS

IT is really remarkable to think that the Differential Double Fulcrum Air Dump Car, designed to accomplish so many desirable things from a performance standpoint, should also lend itself so easily to rugged construction and the simplicity in mechanism that is so desirable in this class of rolling stock. The car's very appearance suggests ruggedness with a minimum amount of maintenance and the absence of "mechanisms". The absence of the multitude of small parts which are usually found in dump car construction certainly means a lot less maintenance on the cars. One of the most noteworthy accomplishments of the Differential Double Fulcrum design, is the entire absence of locking mechanism.

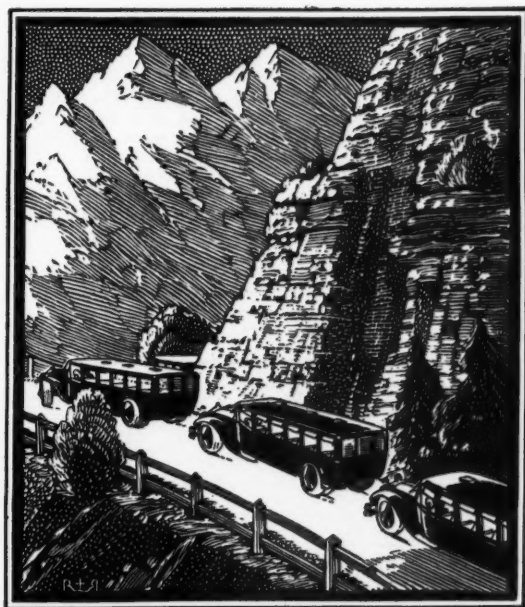
Every dump car operator knows that more trouble can come from locking mechanisms than perhaps any one thing. The Differential Double Fulcrum Air Dump Car is supported on four points directly over the bolster side bearings. There is absolutely no chance for accidental dumping and the car is as stable as a gondola. The floor is supported by lateral beams at very short intervals, leaving no great area of floor unsupported. In short, the car has been adjudged the most rugged of any car yet built, with lowest maintenance cost and greatest expectancy of useful service, by experts in some of the most rigorous dump car service in the world.



Rear View Dumped Position. Note Floor Construction.

The Simplicity and Ruggedness allowed by the Double Fulcrum design, with low maintenance and long life, makes the cost of the Differential Car much lower in the long run.

Bought by telephone \$360,000 worth of busses



THE USE OF LONG DISTANCE is rapidly on the increase. Products are being bought and sold, time and travel are being saved by long distance calls.

There is hardly any limit to the use of Long Distance. When some large order is wanted in a hurry, when travel means delay and expense. In any situation—buying, selling, negotiating—the man who goes by telephone arrives first. He can discuss all details as in a personal interview,

A CHARLESTON, WEST VIRGINIA, interurban railroad needed additional new equipment, quick. It telephoned a nationally known truck and coach company in Chicago for \$20,000 worth of busses. Speeding in over the same lines came a call from Montreal for new busses—\$40,000 worth. Long Distance rang again and Philadelphia placed an order—to the amount of \$300,000. Travel would have meant delay and expense—all used Long Distance!

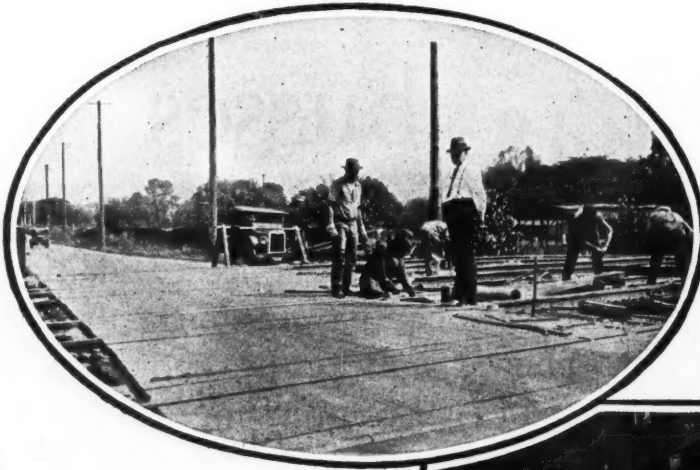
and he can have shipment started at once. His business doesn't have to wait.

We suggest, now, that call across the state or nation that would get some important thing done. We believe you would be surprised if you knew how little it would cost. . . . *Number, please?*

BELL LONG DISTANCE SERVICE



Better crossings demand



Hocking Valley R. R. Crossing, King Avenue, Columbus, Ohio, installed September, 1926. 41 feet wide, 28 feet long, a main artery of train and automobile traffic. Carey Elastite Preformed Track Pavement protects the crossing indefinitely against bad weather and traffic impact.



The two parallel tracks are laid with 130 lb. AREA Rails; the two tracks at an angle are laid with 100 lb. ARA-B Rails. Despite different rail sections and irregular areas to be paved, every piece of material arrived on the job cut to fit. Ordinary tools and ordinary labor were all that were required.

mean less for their elimination

APPROXIMATELY one-fifth of all grade crossing accidents is the result of collisions between vehicles and trains. Why? Because much too frequently the driver of the vehicle finds it necessary to pay more attention to discovering a safe point in the pavement than to the trains, themselves.

That's a danger that Carey Elastite Preformed Track Pavement does away with. Presenting a smooth surface that actually knits and heals under traffic, it permits the driver to give all of his attention to trains. No holes ever develop along rails. And since this material is unusually durable, its use will be found most economical.

Carey Elastite Preformed Track Pavement consists of slabs about two inches thick and sections of rail filler, both made of a fibrous, asphaltic material that knits and heals under traffic. The preformed slabs are shipped cut to fit. Set snugly in place with ordinary tools and ordinary labor, they form a water-tight, traffic-proof crossing that will last indefinitely.

We'd like to tell you more about this improved grade crossing pavement. Write today for full information.

THE PHILIP CAREY COMPANY
Lockland, Cincinnati, Ohio

**Carey
Elastite**
TRADE MARK REGD. U.S. PATENT OFFICE
**PREFORMED
TRACK PAVEMENT**

"Knits and heals under traffic"



Du Pont Gelatin Helps

DU PONT GELATIN DYNAMITES

Greater Range of Adaptability

Du Pont makes a larger range of specialized explosives—the best for certain definite kinds of work. Du Pont also makes one type of explosive with a greater range of adaptability to the job and its conditions than any other type of high explosive—DU PONT GELATIN DYNAMITES.

Balanced Formulas—maximum strength with a minimum of fumes. Sensitive enough to be entirely exploded but, not unduly sensitive to rough handling—no possibility of unexploded charges.

Water Resistant—not affected by water. The only explosive for submarine work, in tunneling and mining where water gushes from the bore holes, and in shaft sinking where water pours down on the workmen.

Plasticity—can be loaded in "uppers." Du Pont Gelatin stays where it is put. No other type of explosive can hold in such holes.

Safest Fumes—far better fumes than any other explosive. Du Pont has even developed a special wrapper for their Gelatins which reduces the amount of noxious fumes to an absolute minimum.

Greatest Disruptive Force, that can be contained in any commercial high explosive of this grade.

DU PONT

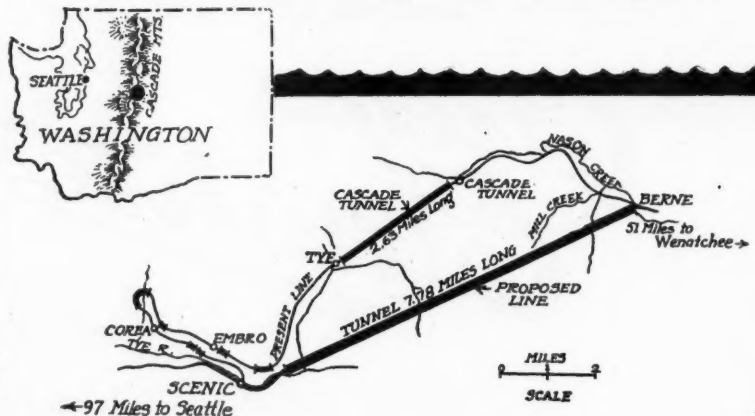
New type explosive developed by du Pont used exclusively in the Great Northern Railway's Cascade Tunnel, at Scenic, Washington

IN the construction of the longest tunnel in the United States and the fifth longest tunnel in the world, du Pont Gelatin Dynamite was used exclusively. What does that mean to you?

Of all explosives, du Pont Gelatin has the greatest range of *adaptability* to all purposes and conditions, the greatest *all-around safety*, the greatest *disruptive force*, and the highest *resistance to water*. The adjoining panel tells why.

More research work has been done on du Pont Gelatin than on almost any other type. Year after year, practical blasters and laboratory chemists worked together to perfect a safer, more adaptable, more powerful explosive. Formula after formula, dozens of them, were tried out and rejected until the present "balanced" formulas were arrived at. **BALANCED** because *maximum strength* is balanced with *minimum fumes*. No other explosive compares with du Pont Gelatin for tunnel and mine work where ventilation is not of the best. In the Shandaken Tunnel, where du Pont Gelatin was used, no complaint about fumes was ever made. At present, du Pont Gelatin is made in a variety of strengths from 20% up to 60%, 75%, 80%, 90% and 100%—each strength always uniform, unvarying, eliminating any guesswork and hazardous uncertainties.

With one exception, du Pont Gelatin is being used in the driving of every important tunnel in the United States where du Pont has distributing facilities.





Make a World Record

A. Guthrie & Company, Inc., advances 8 ft. x 9 ft. heading 1157 feet in one month

THREE successive times, the world's record was broken at the Great Northern Railway Company's tunnel under the Cascade Mountains at Scenic, Washington. In August, 1926, the tunnel was driven forward 937 feet, this record to be in turn broken in September by another record drive of 984 feet, and finally in October, the world's record again eclipsed by a 1157 foot advance. This tunnel, to be 7.78 miles, had to be driven through solid granite. As much as 180 gallons of water per minute was encountered. The tunnel must be completed in two years—the contractors have to make every day count. They use du Pont Gelatin exclusively for all blasting. It met the conditions they had to contend with. It gave them the results they wanted. The workmen liked to work with it.

The work is carried on under the general direction of J. R. W. Davis, chief engineer, Great Northern Railway, St. Paul, and under the personal direction of Col. Frederick Mears, assistant chief engineer, lines west, Seattle. M. J. C. Andrews is the resident engineer. He is assisted by E. S. Jackson at Berne, and M. A. Clegg at Scenic.

For A. Guthrie & Company, Inc., the work is under the personal direction of J. C. Baxter, vice-president, St. Paul, Minnesota. The field forces are under the following staff: R. F. Hoffmark, general superintendent; W. E. Conroy, assistant superintendent; O. C. Hartman, Frank J. Kane and C. G. Jones, superintendents at West Portal Mill Creek Shaft, and East Portal, respectively.

E. I. DU PONT DE NEMOURS & CO., Inc.
Explosives Department
WILMINGTON, DELAWARE



The West Portal, showing the main tunnel.



Top heading on the East Portal at Berne, Washington.

CERTIFIED CORRECT:—

M. J. C. Andrews RESIDENT ENGINEER

M. A. Clegg INSTRUMENT MAN

J. M. Waters LEVEL MAN

A. GUTHRIE & CO., CONTRACTOR

BY W. E. Conroy ASST. GEN. SUPT.

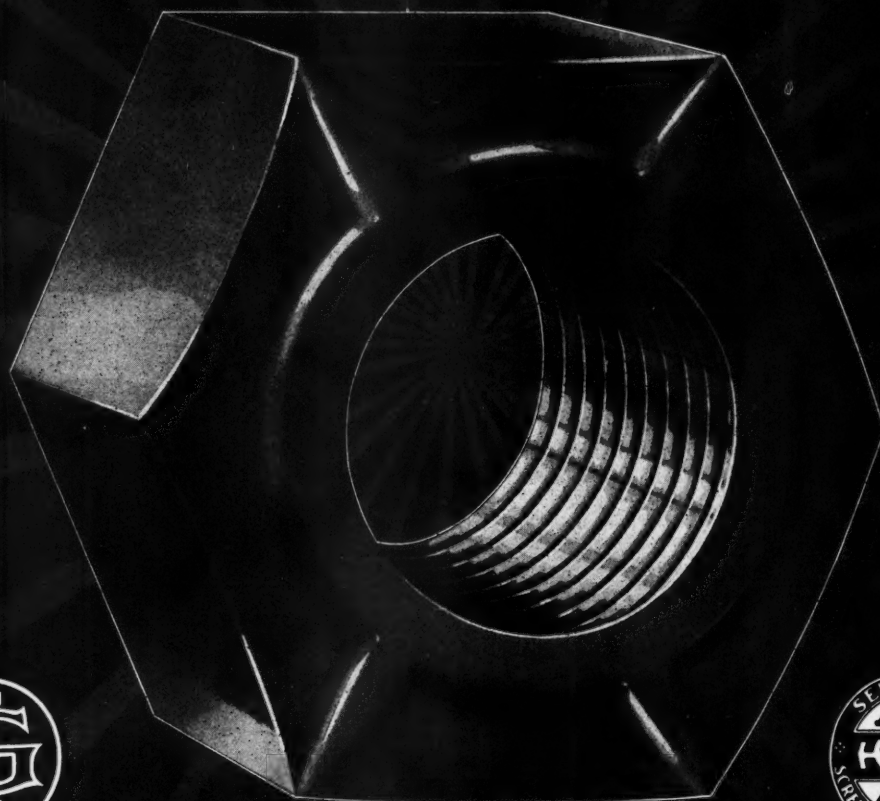
STATE OF WASHINGTON

DU PONT

SELFLOCK

Didn't just

"They lock on every thread"



"The Nut with the Star Crown"

GRAHAM

BOLT & NUT COMPANY

ESTABLISHED 1874

UNIT NUTS

happen!

CAREFULLY developed by 53 years of critical and exacting research, the Selflock Unit Nut is a perfected product, surviving the test of every conceivable form of vibration, before being placed on the market.

The Selflock Unit Nut has the greatest gripping area of any lock-nut made. This is due to the exclusive method of cutting each thread so that a gripping frictional contact is made on both sides of each standard bolt thread.

Every thread is a double locking unit multiplying the locking area to the maximum.

Notwithstanding their great locking efficiency, Selflock Nuts will not damage the bolt thread nor will the lock wear out. They will fit any standard bolt and can be easily started with the fingers and then wrenched tight.

Selflock Unit Nuts will make it possible for industry, and particularly railroads, to save thousands of dollars in maintenance because Selflock Nuts remain permanently tight under the most racking vibration. They can't come loose because of the peculiar design of the Selflock thread.

All Selflock Unit Nuts are identified by the Star Crown—
Specify Selflock Nuts by name.

ANY ~ Pittsburgh ~



See Our Exhibit
Space No. 114

IMPROVED
HIPOWER

WHAT'S IN A NAME?

16 Points of Merit of IMPROVED HIPOWER

Spring Washers

I nstantaneous reaction retards abrasion of joint bars.

M illions sold increasingly every year.

P roved fundamentally right and necessary.

R enewed orders from those originally skeptical.

O . K'd by practically all of the leading railroads of the United States and Canada.

V ictor in every test—service or laboratory.

E conomical: It will increase net earnings
Costs less per 1000 lbs. pressure.

D esignedly restricted in range.

H usky enough to "stand the gaff" of modern traffic.

I mpact on bolts is absorbed and distributed.

P arkerized: Hence rust proof.

O utstanding: Because unique.

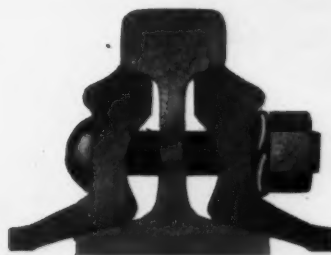
W ell made, heat treated and tempered.

E nergy: A reservoir of high wrenching power.

R esilient: Elastic limit of steel is 175,000 lbs. per sq. in.

S ound in principle, simple, foolproof.

THE NATIONAL LOCK WASHER CO.
NEWARK, N. J., U. S. A.

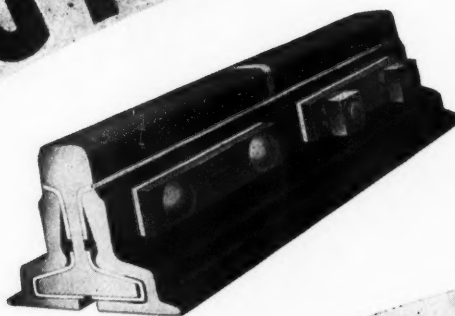


Maintains the Bolted Security of Railway Track Joints

NATIONAL RAILWAY

ANNUAL
COLISEUM
MARCH

KEEPING PACE

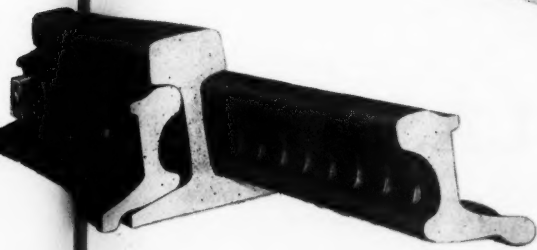


FOR
INTEREST
AND
PROFIT

The Rail Joint

Y APPLIANCES ASSOCIATION
AL EXHIBIT
UM CHICAGO
CH 8-9-10 & 11

WITH PROGRESS



VISIT
BOOTH
NOS.
79-80

Co. 165 BROADWAY, NEW YORK CITY

Your Material is Proven

1927

Cast Iron Pipe today is the
World's Standard for under-
ground construction of gas
and water mains

1820

This Cast Iron Pipe, dug
up in Baltimore in 1916—
was laid sometime between
1820 • 1835

CAST IRON PIPE LASTS

THAT is the greatest asset that it, or any other material, can possess for use in underground construction.

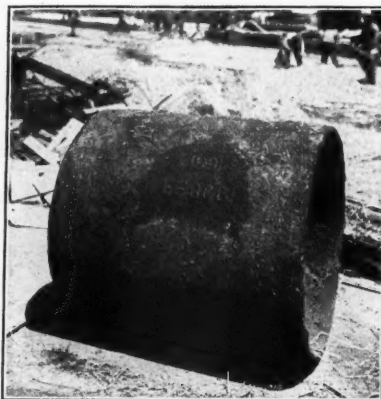
In water and gas mains Cast Iron Pipe has proven that the first hundred years of use do not even give an indication of the limits of its working life under average conditions.

No case has ever come to light where Cast Iron Pipe wore out under average service conditions.

When the pipe is going under pavement, as almost all mains are, the durability of Cast Iron Pipe becomes of tremendous importance to the water or gas engineer. A properly laid main

of Bell and Spigot Cast Iron Pipe can be placed under pavement with the assurance that it will last and function indefinitely.

And if at some future date, changing conditions should necessitate a change of distribution systems, the Cast Iron Pipe can be taken up and relaid elsewhere.



With only the dirt washed off around the numerals this piece of pipe is a part of a line taken up after thirty years' service and relaid elsewhere.

The durability of Cast Iron Pipe makes its use desirable everywhere. The Bell and Spigot, and other standard Joints and Fittings make it adaptable to any construction conditions.

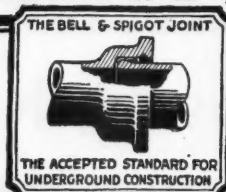
This Bureau will gladly co-operate without obligation in any phase of its use.

Address: RESEARCH ENGINEER

THE CAST IRON PIPE PUBLICITY BUREAU, PEOPLES GAS BUILDING, CHICAGO

CAST IRON PIPE

Our new booklet, "Planning a Waterworks System," which covers the problem of water for the small town, will be sent on request



Send for booklet, "Cast Iron Pipe for Industrial Service," showing interesting installations to meet special problems

In the New Sixty Million Dollar Cleveland Union Terminal

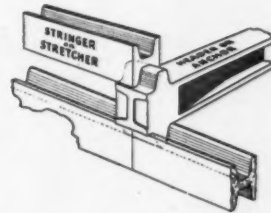
R. C. RETAINING WALL UNITS Cut the Costs

BEHIND AND BELOW this towering structure are many permanent retaining walls built of R. C. Precast Concrete Units. In strength and appearance they meet the high standards of this great construction job.

This is only one of many times R. C. Units have been used by the Van Sweringens, who tested and proved them long ago.

The Pere Marquette; Ohio River Edison Company; Stevens & Wood, Inc.; Long Island R. R.; West Virginia and Colorado State Highway Departments; C. B. & Q. R. R.—are some recent users of R. C. Units.

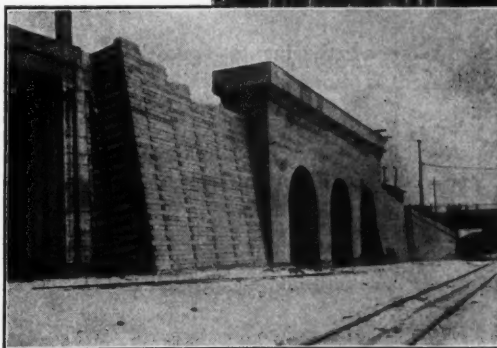
Impressive testimony—this distinguished patronage—to the economy and reliability of R. C. Construction!



R. C. UNITS are 100% adaptable to your cuts and fills. No detailed designs are necessary. Common labor places the units and follows with the backfill. No waiting for walls to set. No forms to build and tear down. Usually cost is cut over 50%:

BECAUSE—

1. **No Skilled Labor Required.**
R. C. Units automatically interlock and square away.
2. **No Mason Work**
No dowels, fittings, pillow or filler blocks.
3. **No Drainage Problems**
And no massive foundations.
4. **No Salvage Loss**
R. C. Construction is permanent or 100 per cent salvageable
5. **Assured Results**
R. C. Units can be specified as definitely as structural steel.



R. C. Walls for embankment carrying re-located Columbus Road. Solid Fillers can be used with R. C. Units—as shown above.



This R. C. Wall was built to a height of 32 feet, on a batter of only one inch to the foot.

SEND FOR THIS FREE BOOK

The R. C. Book contains illustrations of many typical installations—shows wall details and gives standard specifications. Also other useful information. Write or send the coupon for a copy—for present use or for your files.

THE R. C. PRODUCTS COMPANY, Inc.
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New York Chicago Norfolk Pittsburgh San Francisco
St. Louis Buffalo

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PRODUCTS
PRECAST RETAINING WALL UNITS

The R. C. Products Co., Inc.
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Send me your **free** book of Retaining Wall Data ☐
Also complete information on the use of R. C.

Units for the following purposes _____

Company Name _____

Individual's Name _____

Address _____



Unique!

*only one moving part—
strikes 1500 blows a minute.*

The **SYNTRON** ELECTRIC **TIE TAMPER**



The light weight portable power plant of the Syntron Tie Tamper can be easily lifted by any track gang and is provided with dolly wheels to be run along a track when being moved — and automatically supplies current to SYNTRON Tamper.

HERE is a tie tamper that will meet the instant approval of every Railroad man interested in more efficient and more economical track maintenance.

Through a unique application of magnets energized by alternating current, the Syntron Tie Tamper strikes 1500 blows per minute making one section laborer equal to three with pick tampers.

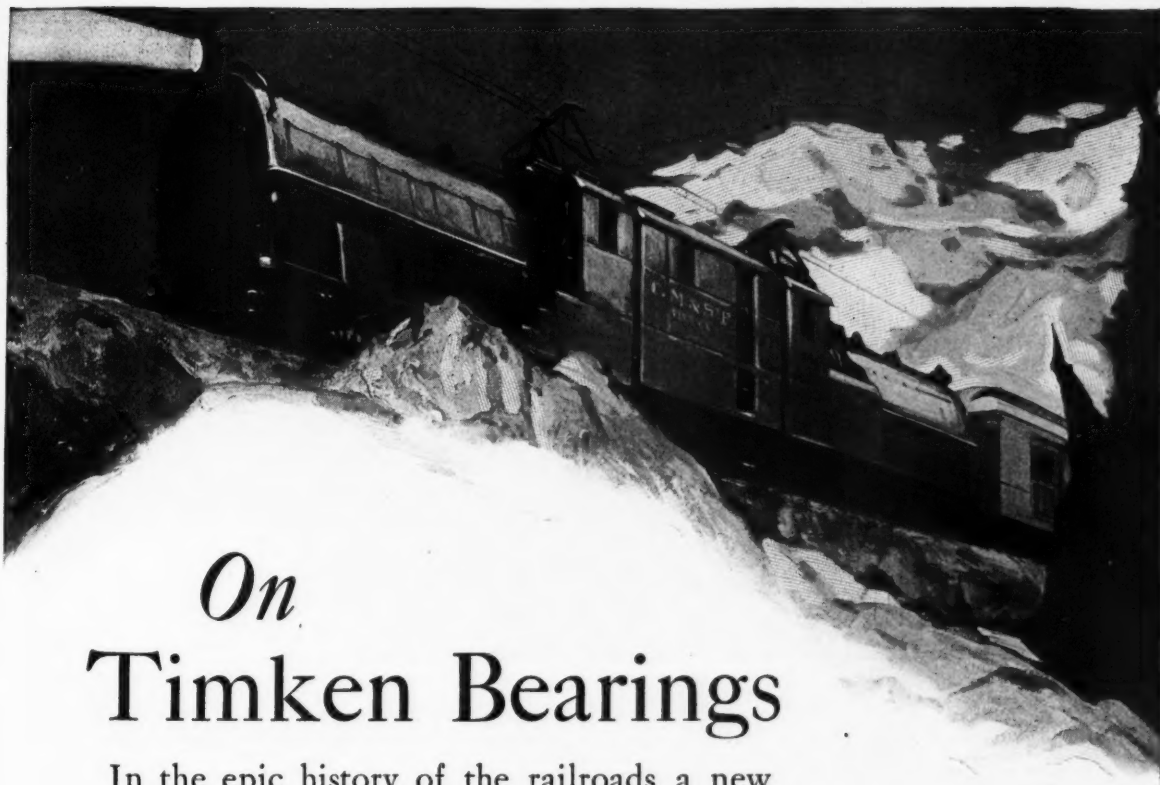
This ingeniously designed tamper, packs the ballast tighter than it could ever be done by hand and results in a tamping job that lasts twice to three times as long.

In construction, the Syntron is a model of simplicity, distinctly different than any tamper yet devised. Having only one moving part, the SYNTRON has nothing to go out of order, nothing to wear out, and requires no skill to operate.

In a word—the SYNTRON is superior in every way to other types of tie tampers, and we welcome the opportunity to prove it.

THE SYNTRON COMPANY

LEXINGTON AVENUE • PITTSBURGH, PA.



On Timken Bearings

In the epic history of the railroads a new chapter opens. Cars regularly equipped with anti-friction bearings are here. Timken Bearings make it possible. The first standard Timken-equipped cars go into operation on the Chicago, Milwaukee and St. Paul.

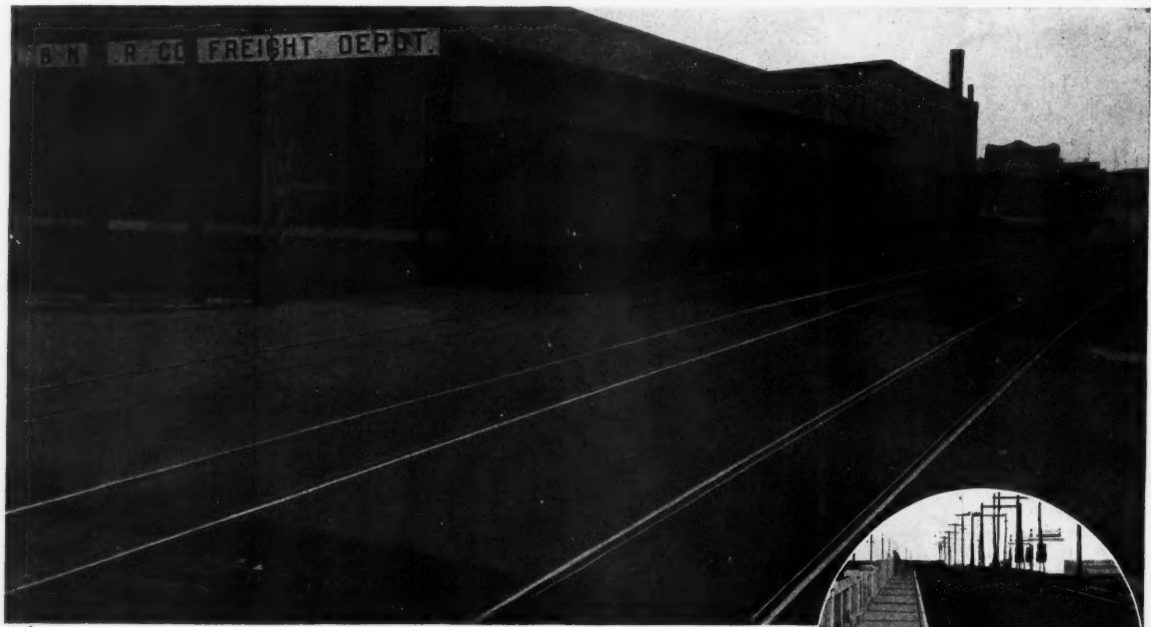
Timken Tapered Roller Bearings for this progressive railroad's crack flyers, THE OLYMPIAN and THE PIONEER LIMITED, mark the day of new ease, quiet and surety in long distance travel.

On guard against the wear and waste of friction, Timken Tapered Roller Bearings not only conserve power, but put an end to hot boxes and the whole lubrication difficulty.

Steel wheels speeding steel grades and curves cause stresses which have been thought beyond anti-friction bearings. Here again, as in every other type of mechanism, throughout Industry, the "impossible" has yielded to Timken design, construction, and resources.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

TIMKEN *Tapered Roller* **BEARINGS**



L. & N. R. R. Memphis, Tenn.

Kyrock Surface on heavy duty grade-crossing. Four busy tracks and a busy street, subjected to heavy loads and considerable steel tired traffic. Maintenance nil. Inset shows "Kyrock" surface on Biscayne Bay Causeway. Carried traffic estimated at 30,000 vehicles daily for seven years under Florida Sunshine—Not a crack or roll in it today. Kyrock resists vibration.

Kyrock cuts costs at crossings

Kyrock at grade-crossings offers you simpler construction, longer life, easier maintenance and less of it. On bridge floors it reduces vibration to its lowest terms. "Kyrock" is laid *cold*. Stored in the open without damage. It retains its life, cut it for track repair and the refill bonds under traffic. Perfect waterproofing and non-conductor. Requires no heating or mixing. Any section crew can lay "Kyrock" successfully without special equipment. Converts cracked concrete, worn brick, block and macadam platforms, runways, shop floors into smooth, resilient, long-life pavements. Investigate "Kyrock."

Make This Test—

"Kyrock" your most troublesome grade-crossing or platform, observe results and you will soon adopt it for the division. Write today for your copy of "Kyrock for Railway Construction and Maintenance."

KENTUCKY ROCK ASPHALT Co., Incorporated, LOUISVILLE, KY.

Kyrock

The Perfect Pavement



WORKABILITY is the KEY to BETTER CONCRETE AT LESS COST



UNIFORMITY
and freedom from segregation



Integral
WATER-TIGHTNESS



Higher Effective
STRENGTH

Strength—Uniformity—Watertightness—Appearance—Cost—all vitally affected by workability

The views above illustrate typically the quality of concrete obtained with the aid of Celite in all classes of concrete construction.

Top—A workable Celite mix flowing into place in the construction of the Fletcher Drive Bridge, Los Angeles, Calif. Lynch-Cannon Eng. Co., contractors.

Left—The Thirteenth Church of Christ, Scientist,

Hollywood, Calif. Allison & Allison, Architects; Pozzo Construction Co., contractors.

Right—Water filtration plant, Spartanburg, S. Carolina. Solomon, Norcross & Keis, Atlanta, Ga., Engineers; Tucker & Laxton, Charlotte, N. C., contractors.

Below—Soldiers Field, Chicago. Holabird & Roche, Architects; John Griffiths & Son Co., contractors.

CELITE

Insures Better Concrete at Less Cost

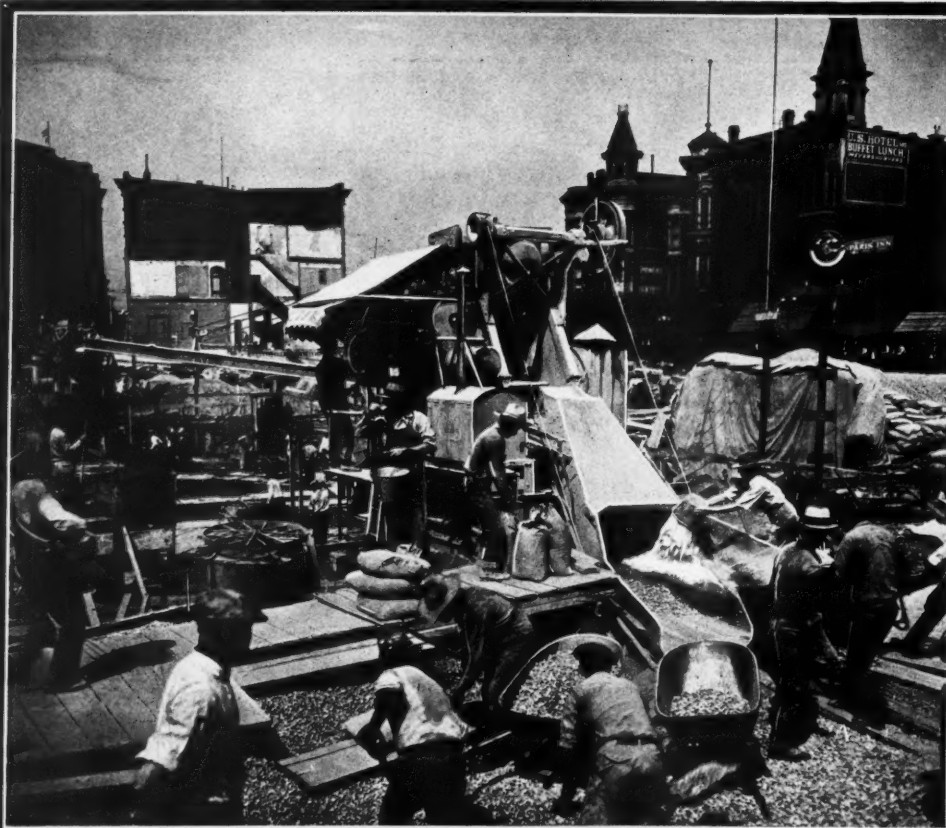




Added at the Mixer

The siliceous admixture Celite is simply added with the other dry ingredients at the concrete mixer, as shown at the left. Its function is purely physical—that of preventing segregation during transporting and placing. It makes mixtures of relatively dry consistencies easily workable. The improvement in workability effected by 4 per cent of Celite in 1:2:4 concrete, for example is about that which should be expected from a 25 per cent increase in the cement content.*

* "Economic Value of Admixtures" by Messrs. Pearson and Hitchcock of the U. S. Bureau of Standards, presented at the 1924 meeting of the American Concrete Institute.



CELITE

Insures Better Concrete at Less Cost

Many well known architects and engineers today are writing Celite into all their concrete specifications. Contractors, once they have had experience with it, often ask authority to use it in subsequent work.

It is not claimed that this workability agent is a "cure-all" for concrete troubles. We know of no instance, however, where Celite, used properly, has failed to increase workability, prevent segregation and improve the quality of the final concrete—more than enough to repay its cost.

Mail the coupon for full information.

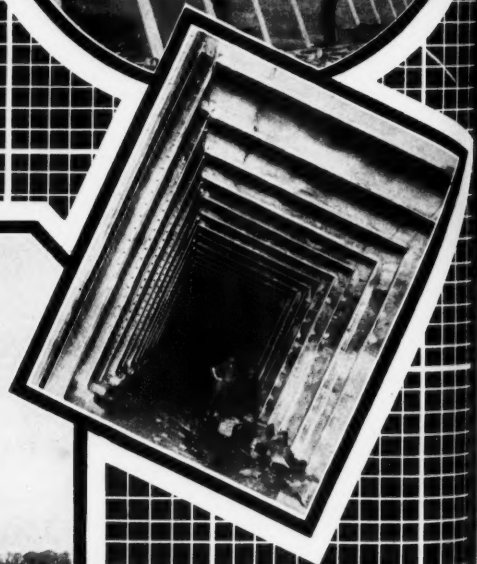
CELITE PRODUCTS COMPANY

New York—11 Broadway
Los Angeles—1320 So. Hope St.
Chicago—53 W. Jackson Blvd.
San Francisco—140 Spear St.
Offices and Warehouses in Principal Cities
Celite Products Limited, New Birks Bldg., Montreal, Canada
Celite Products Corporation, Westminster, London, England



Segregation troubles ended when 3% of Celite was added to the central mixed concrete placed in the St. Louis reservoir pictured at the right.

Below. Curing concrete pipe made with Celite. Many concrete products manufacturers state that Celite more than pays for itself.



Above: Inside the Philadelphia Municipal Subway. 4 per cent of Celite in 1:2:4 central mixed concrete used in this project by Keystone State Construction Company, Contractors.

Tear off and Mail for Booklet on Admixtures

Celite Products Co: Without placing me under any obligation send me your booklet 325 on admixtures in concrete. I am particularly interested in concrete work of this class:

Name _____

Address _____

City and State _____ S

Why we use Prest-O-Lite dissolved acetylene

In oxy-acetylene welding and cutting, fuel value means much more than quantity of heat per pound of fuel. It means that the fuel—acetylene—must be uniform and always available.

For all portable operations, Oxweld Railroad Service uses Prest-O-Lite dissolved acetylene which has been manufactured for 21 years and is now produced in 31 separate plants located at important railroad junction points.

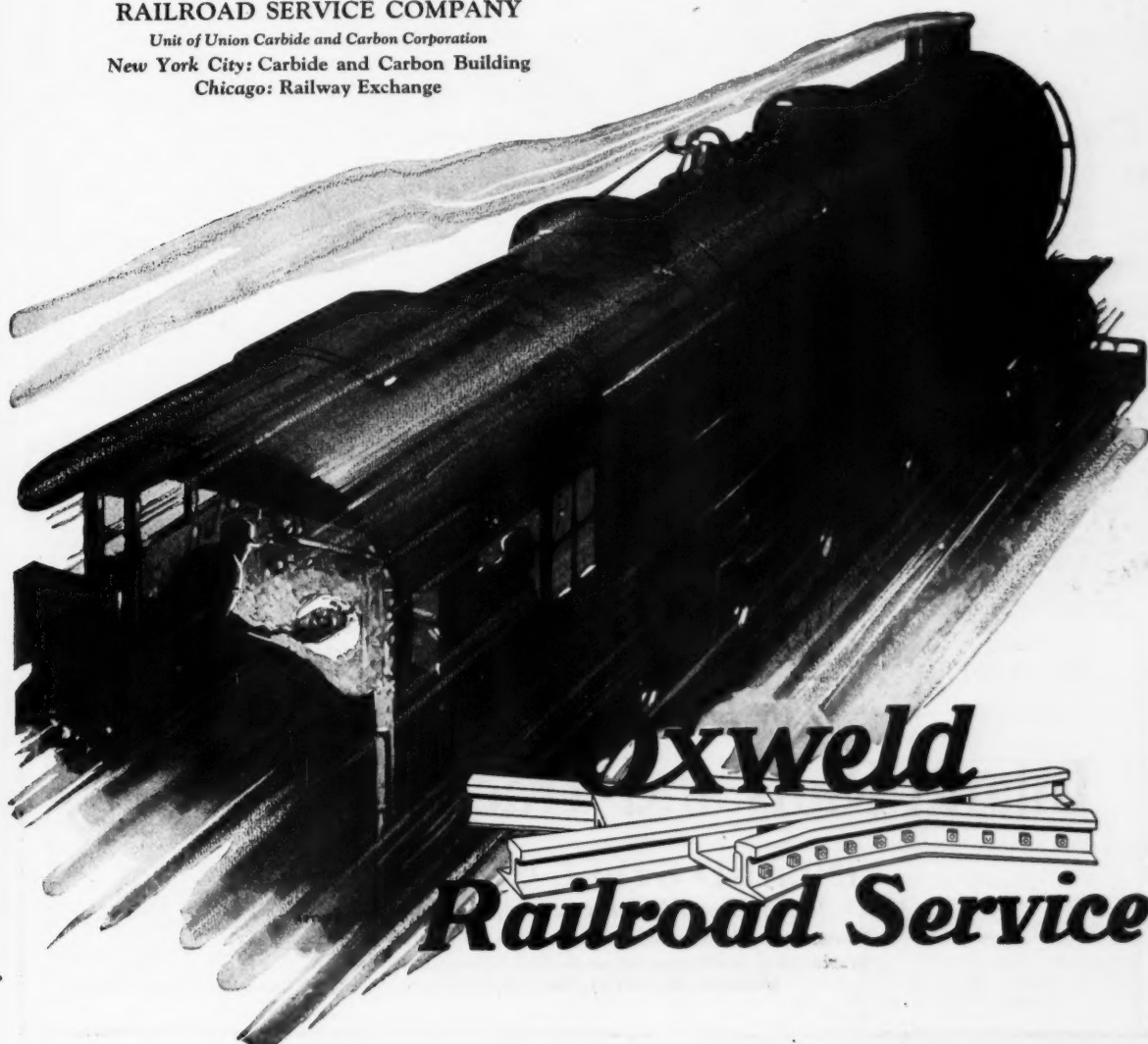
But the most important factor in fuel

value is economy in its use. That is a part of Oxweld Railroad Service. It means a thorough knowledge of what can be accomplished for each railroad by oxy-acetylene welding and cutting. It means the adaptation of oxy-acetylene technique to each special job.

It is possible only through a competent progressive staff, like that of Oxweld Railroad Service, which has been developing for 14 years and which now numbers more than 200 instructors.

THE OXWELD RAILROAD SERVICE COMPANY

Unit of Union Carbide and Carbon Corporation
New York City: Carbide and Carbon Building
Chicago: Railway Exchange



Oxweld Railroad Service



*Strength Where Strength is Needed
For Dependable Track—*

Inland Rails and Track Accessories

INLAND STEEL COMPANY

38 South Dearborn Street, Chicago

Works: Indiana Harbor, Ind.; Milwaukee, Wis.; Chicago Heights, Ill.

*Branch Offices and Representatives: St. Paul, St. Louis, Salt Lake City,
Milwaukee, Kansas City, New Orleans, El Paso*

Heavy Duty Railway Motor Car

Casey Jones 551

REG. U.S. PAT. OFF.

Standard Ford Motor-Gear Transmission



Write for
Full Information

NORTHWESTERN MOTOR CO.

General Office and Factory
EAU CLAIRE, WISC.

Branch Offices:

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W. NEWTON JEFFERS, INC.

Eastern Representative, 1115 P Street N. W.

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WESTERN RAILWAY SUPPLY CO.

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FOREIGN

KOPPEL, INCORP. CAR & EQUIP. CO.

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FOR EXTRA GANGS—BRIDGE CREWS—HUMP AND
SIGNAL SERVICE—OPERATING WEED MOWERS—DISC-
ING MACHINES AND ALL HEAVY DUTY SERVICE.
CAPABLE OF MOVING 150 MEN WITH TRAILERS.

THE RIGHT CAR FOR EVERY CLASS OF SERVICE

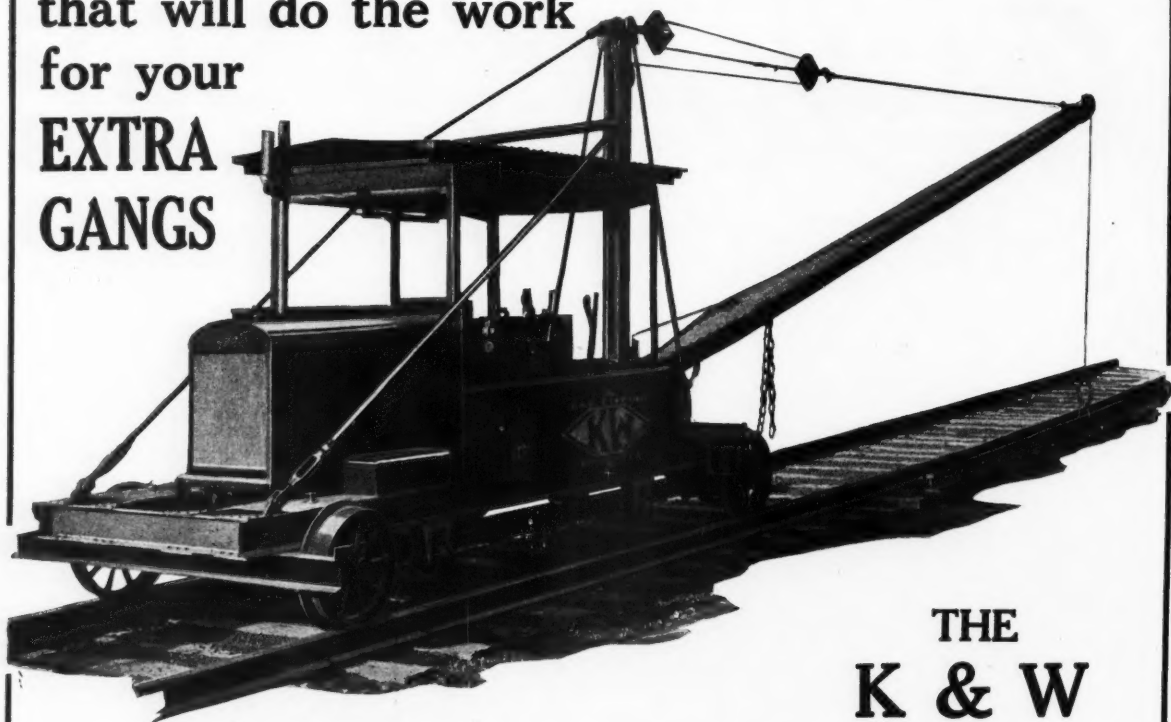
Class A	For Heavy Duty	Casey Jones 551	4 to 150 Men—Trailers
Class B	For Standard Section	Casey Jones 521	2 to 30 Men—Trailers
Class C	For Light Inspection	Casey Jones 531	1 to 4 Men

NORTHWESTERN MOTOR CO.

MANUFACTURERS

FACTORY AND GENERAL OFFICE—EAU CLAIRE, WIS.

HERE IS THE ELECTRIC POWER
that will do the work
for your
EXTRA
GANGS



**THE
K & W
GAS-ELECTRIC RAIL LAYER**

Is a very efficient rail layer owing to the flexibility of the electrical method of operation which eliminates friction clutches throughout.

This same electrical energy is available for sawing, drilling, grinding, lighting and the operation of all kinds of electrically driven track tools and appliances driven by direct current.

A most flexible, positive and useful power unit now available for track maintenance, installation and salvage work.

A power boom swing for operation of single line clamshell buckets or an additional hoist drum for operating the two-line bucket are available features.

Maximum safety due to visibility, sturdiness of construction, ease of operation and upkeep are other features worthy of your consideration.

The word "season" is now an obsolete factor which makes THE K. & W. GAS-ELECTRIC TRACK LAYER a very profitable investment bringing in returns the year round.

Let us help you thoroughly modernize
your maintenance-of-way departments.

*Write for full particulars
and prices.*

THE K. & W. EQUIPMENT COMPANY
513 W. JACKSON BLVD. CHICAGO, ILLINOIS

MAGOR

AUTOMATIC AIR DUMP CARS



MAGOR improved automatic air dump cars have become an essential tool of production and economy on railroads today. The heavy duty conditions under which dump cars are usually required to operate demand the Magor and these have guided the maker in its development.

The outstanding advantages of Magor improved air dump cars are—

Dumping may be controlled from locomotive or car separately.

Cars may be dumped in either direction instantly and with equal facility, without change of parts or prior adjustment.

Standard equipment to A. R. A.

Positive action and simplicity in dumping.

Low height of advantage in ditching service.

Special air operating features which facilitate operation with reduced number of parts.

Angle of slope in dumped position more than 50 degrees insuring complete discharge.

The most impressive evidence of its superiority is its selection by roads which only consider dump cars from the standpoint of operating and maintenance savings.

Catalog and details on request

MAGOR CAR CORPORATION, 30 Church St., New York, N. Y.



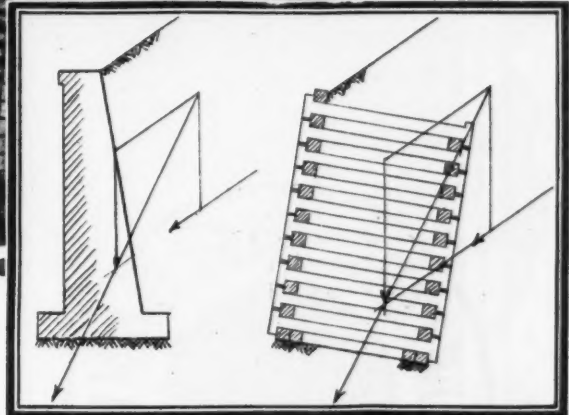
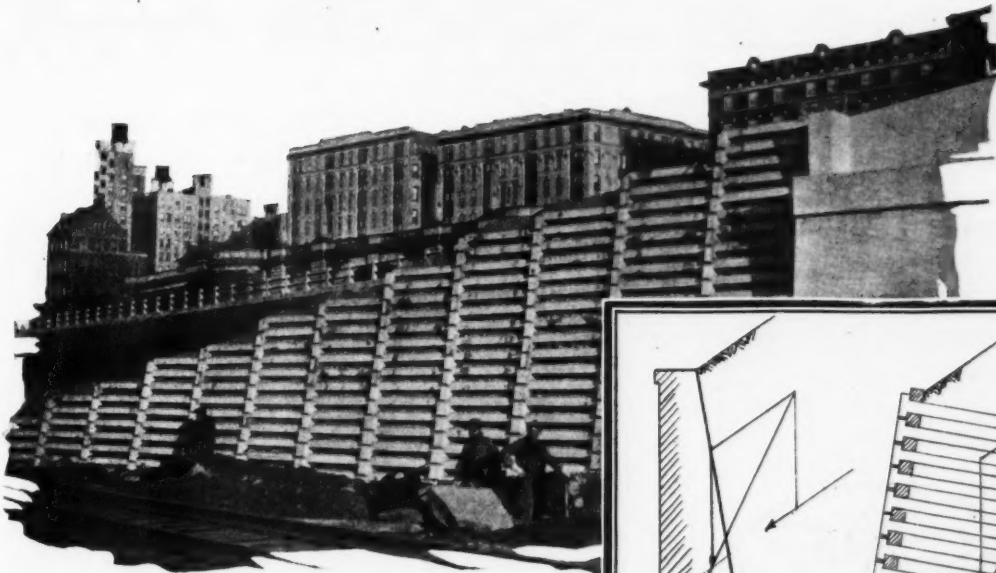
JORDAN SPREADER

The Composite Spreader-Ditcher, which is the Jordan Spreader with the composite Spreader-Ditcher Attachment, performs all the functions of the Spreader (moves earth, spreads bulky materials, plows snow) and in addition will shape ballast and subgrade, form new ditches or clean old ones, and trim the banks of cuts to a uniform slope.



An all-year Machine. In use on
North America's leading railroads.

Write for Copy of New Catalog



Wall Stability!

THE basic theory of concrete crib wall designs is the same as that for monolithic walls. Note the typical graphic determination of the stability of two equivalent walls shown in the sketch above.

The general adoption of concrete crib wall construction in recent years has brought about a rapid development in the art of building such walls and in the variety of their applications. The many installations of crib walls constructed of Massey Type

"H" units are demonstrating the progress made in this direction.

Massey Cribbing is economical, is suitable for either temporary or permanent locations, can be erected without any special field equipment, and has practically one hundred per cent salvage value in case of removal.

Massey engineers will be glad to consult with you on any retaining wall problems, and will, on request, furnish detailed information regarding Type "H" cribbing.

MASSEY

Concrete Products Corporation, Peoples Gas Building,
Chicago

Sales Offices: New York, Atlanta, Cincinnati, St. Louis,
Los Angeles

Canadian Concrete Products Co., Ltd. Transportation Building,
Montreal, Que.

Massey Cribbing is produced in the same plants and is of the same high quality as Massey Culvert Pipe and other precast concrete products which have been standard construction on the leading railroads for years.

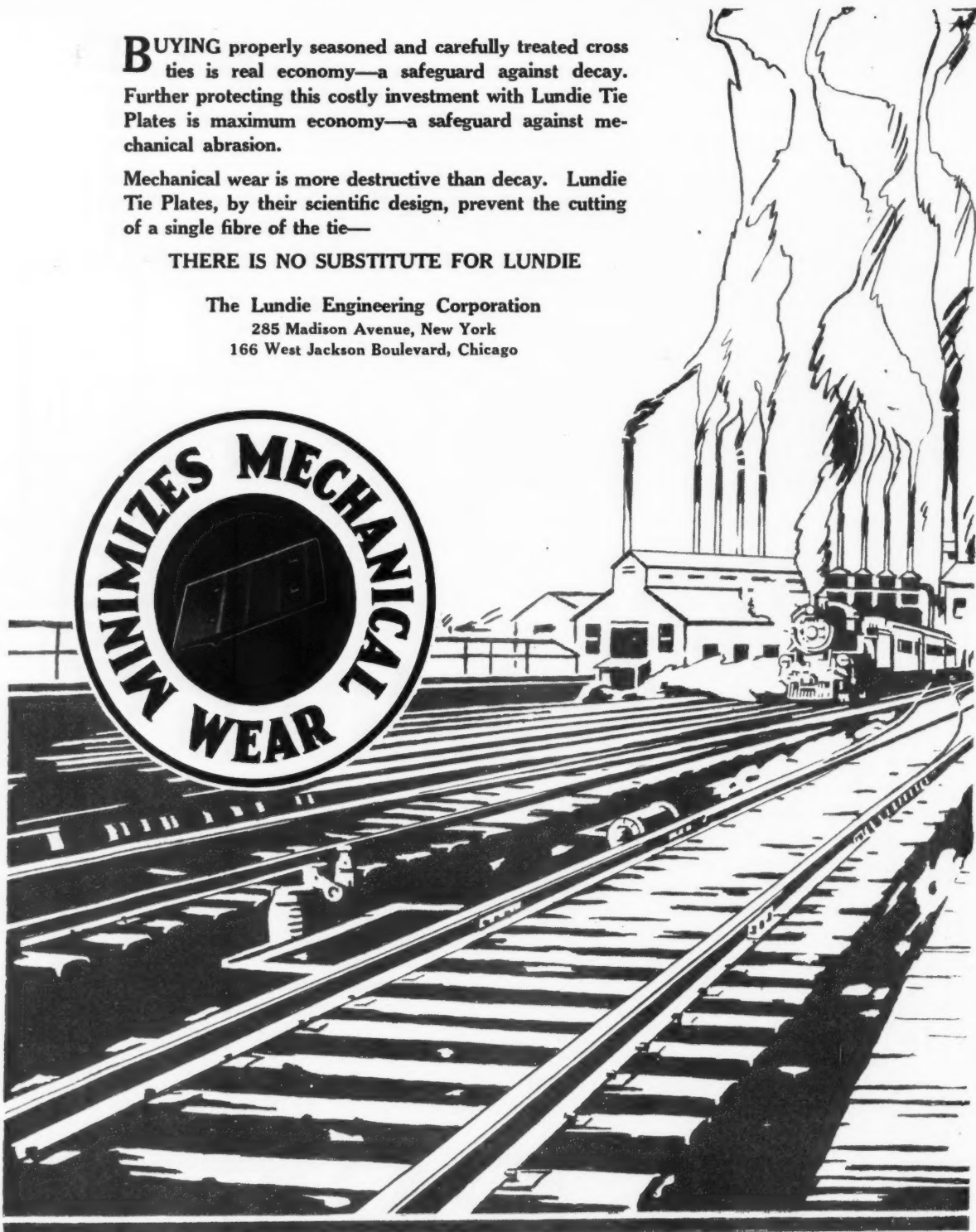
REM 3-Gray

BUYING properly seasoned and carefully treated cross ties is real economy—a safeguard against decay. Further protecting this costly investment with Lundie Tie Plates is maximum economy—a safeguard against mechanical abrasion.

Mechanical wear is more destructive than decay. Lundie Tie Plates, by their scientific design, prevent the cutting of a single fibre of the tie—

THERE IS NO SUBSTITUTE FOR LUNDIE

The Lundie Engineering Corporation
285 Madison Avenue, New York
166 West Jackson Boulevard, Chicago



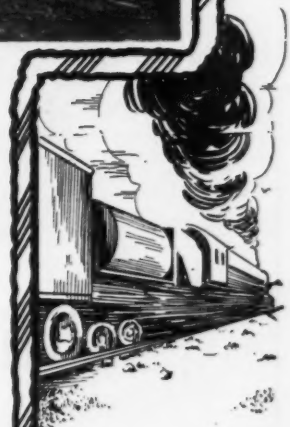
LUNDIE

TIE PLATE

The Lawrence All Steel Bumping' Post

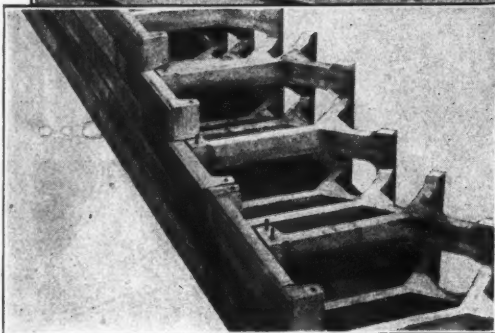
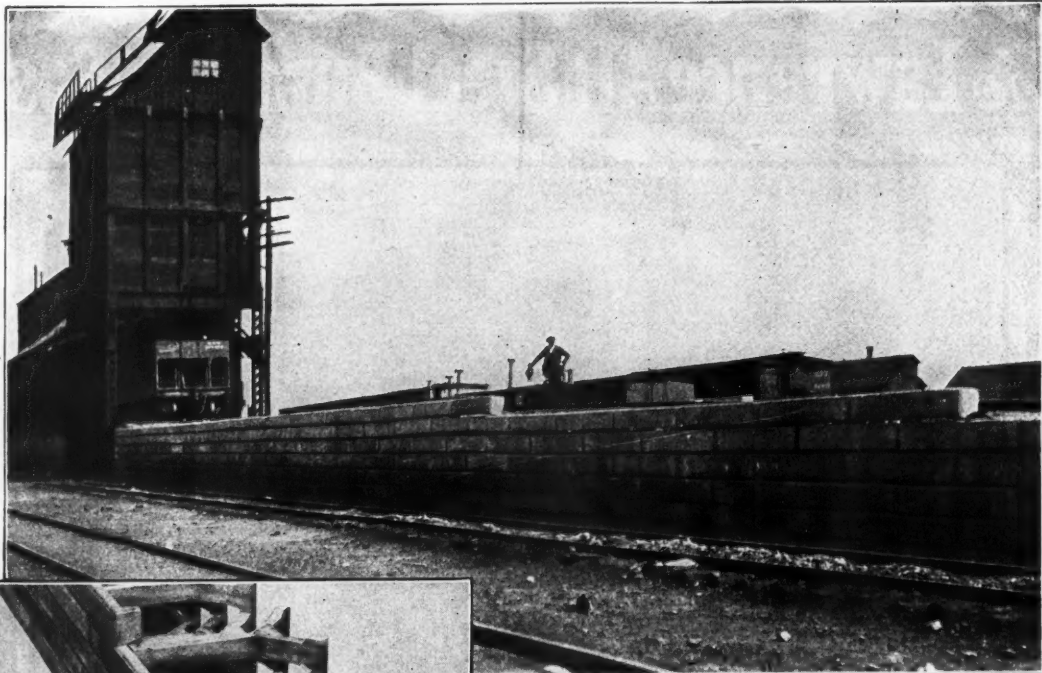


This Post
will be on
Exhibit in
Space No. 263
at the
Coliseum
in Chicago
from March
7th to 10th
inclusive.
Do not fail
to see it.



Part of the post is buried in the earth, which acts as a cushion, retarding and stopping the cars without damage to posts or cars.

LOUISVILLE FROG & SWITCH COMPANY
LOUISVILLE KENTUCKY



A Federal Concrete Crib Wall consists of two substantial units, thus eliminating the usual third member in the backfill. The Y-shaped header ends form a rear wall of cellular construction securely locked in the backfill. The stretcher or face members interlock with the headers, forming a retaining structure of great strength, economy and attractive appearance.

This Cribbing Easily and Quickly Installed

FEDERAL Concrete Cribbing Units have proved that they are easier to install than any other type of retaining wall. Permanent, but can be easily relocated with practically 100 per cent salvage; economical in first cost,

improve with age and require no maintenance. A one-inch continuous slot assures free drainage with no possibility of backfilled material filtering through. Illustrated above is an installation at Chicago for the Grand Trunk.

For further information write to
FEDERAL CEMENT TILE COMPANY
608 South Dearborn Street, Chicago, Illinois

FEDERAL CONCRETE CRIBBING



30 Yard Western Automatic Air Dump Cars equipped with aprons engaged in trestle filling on the Santa Fe.

Not Only Save Labor but Make it Easier for YOU

Western Air Dump Cars in Railroad Maintenance of Way are more than labor-savers—they will save *YOU* from undue worry, save you from being everlastingly on the job—make it possible for you to keep up with your exacting task.

*Write for Our
Golden Anniversary Catalog No. 71.*

The most important quality in man or machine is Dependability.

Western Air Dump Cars, equipped with aprons for railroad use, can be depended on always to do your work when you want it, how you want it, and at the lowest possible cost.

Western Air Dumps are all-service cars. From handling snow in winter, ditching in spring and fall, to trestle filling in summer, you can depend upon them to keep down your maintenance-of-way costs and give you a chance to sleep.



Western Wheeled Scraper Company

Builders of Air Dump Cars

AURORA, ILLINOIS

A WATER SUPPLY THAT IS DEPENDABLE



A lonely watering station on the Frisco in Mississippi

Along the Steel Highway, in remote and isolated places, it is often necessary to construct water stations where the Monarchs of the rail may quench their thirst. The mad rush across the continent in their service to industry must not be interrupted.

A Layne Well System insures a full tank at all times, thereby eliminating that chance of delay.

Layne Wells serve the leading Railroads.

Illinois Central—Missouri Pacific—Baltimore & Ohio—Chicago Northwestern—Chicago, Rock Island & Pacific—Erie—Chicago, St. Paul, Milwaukee & Omaha—Louisville & Nashville—Pennsylvania—St. Louis & Southwestern—St. Louis & San Francisco—Wabash—Union Pacific—San Antonio & Aransas Pass—Hocking Valley—Florida East Coast—Gulf, Colorado & Santa Fe—El Paso Southwestern.

Where Service is Paramount—Layne Wells are Found

Layne & Bowler Manufacturing Company

MEMPHIS

HOUSTON

Eleven Subsidiary Companies

LOS ANGELES

Master of All Trades—and Jack of None

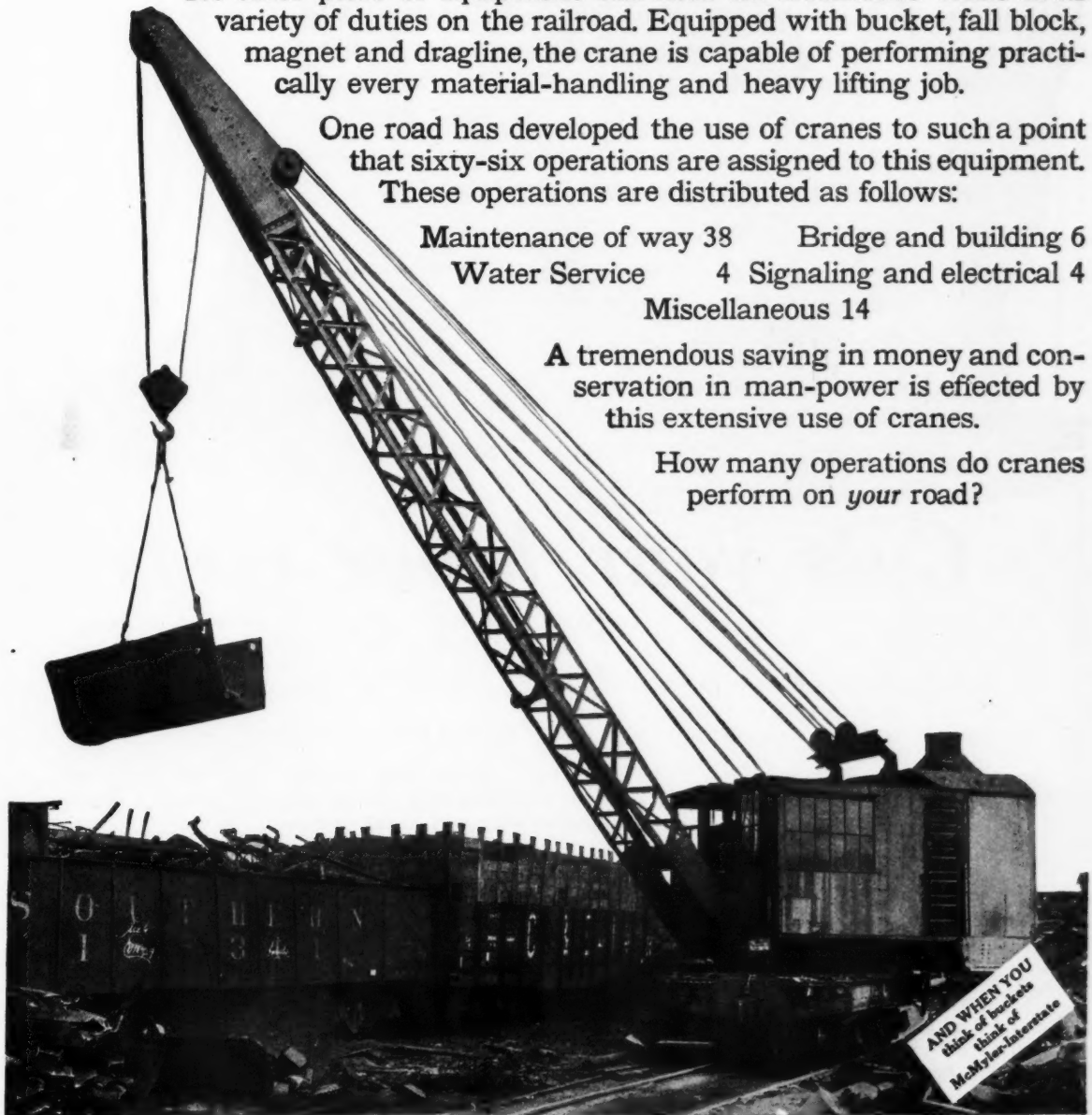
No other piece of equipment can rival the locomotive crane in its variety of duties on the railroad. Equipped with bucket, fall block, magnet and dragline, the crane is capable of performing practically every material-handling and heavy lifting job.

One road has developed the use of cranes to such a point that sixty-six operations are assigned to this equipment. These operations are distributed as follows:

Maintenance of way 38	Bridge and building 6
Water Service 4	Signaling and electrical 4
Miscellaneous 14	

A tremendous saving in money and conservation in man-power is effected by this extensive use of cranes.

How many operations do cranes perform on *your* road?



C-4-17

Steam Shovels • Gas Shovels • Locomotive Cranes • Clam-shell Buckets

McMyler-Interstate

NEW YORK
BUFFALO

PHILADELPHIA
PITTSBURGH

CLEVELAND

DETROIT
CHICAGO

SAN FRANCISCO
LOS ANGELES



Cuts your labor costs

PRACTICALLY everything connected with track work involves a lift. The Bloxham is operated with a *pull* which gives relief to tired muscles. That is one reason why the man on the job approves it.

Three men using Bloxham liners will not only do the work of nine or ten men but they will do it in half the time. Furthermore, because of its ease of operation, your men will line as much track in the afternoon as they will in the morning.

Bloxham liners are guaranteed for a year against breakage in service. They are made of electric steel and can be supplied with a long base for gravel ballast and a short base for rock ballast.

Bloxham liners will cut your maintenance of way labor costs. We will make a demonstration at your request.



W. R. McDonough & Co.,
Nat'l Bldg., Cleveland, O.

S. Douglas Gibson, Suite 744,
Transportation Bldg.,
Washington, D. C.

W. R. Payton,
Railway Exchange Bldg.,
St. Louis, Mo.

John A. Findlay,
105 Victoria St.,
Toronto, Ont.

J. J. Crawford,
Stahlman Bldg.,
Nashville, Tenn.

Track Specialties Co.,
29 Broadway,
New York City

CHICAGO STEEL FOUNDRY CO.
Kedzie Ave. at 37th Street Chicago, Illinois

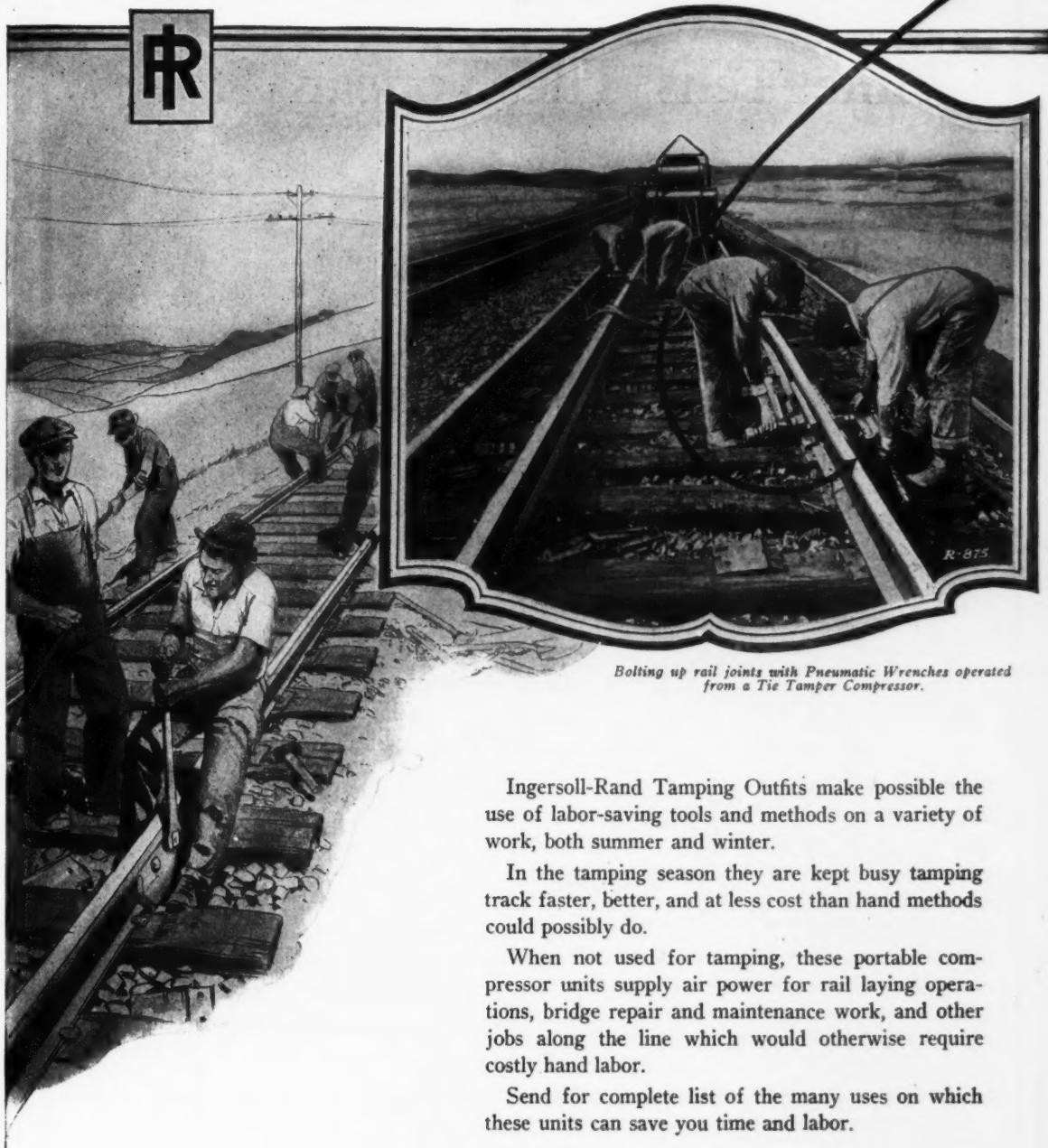
BLOXHAM

Track Liners



REM 3-Gray

Speed Up the Work With I-R Track Tools



Bolting up rail joints with Pneumatic Wrenches operated from a Tie Tamper Compressor.

Ingersoll-Rand Tamping Outfits make possible the use of labor-saving tools and methods on a variety of work, both summer and winter.

In the tamping season they are kept busy tamping track faster, better, and at less cost than hand methods could possibly do.

When not used for tamping, these portable compressor units supply air power for rail laying operations, bridge repair and maintenance work, and other jobs along the line which would otherwise require costly hand labor.

Send for complete list of the many uses on which these units can save you time and labor.

INGERSOLL-RAND COMPANY—11 BROADWAY, NEW YORK CITY

Offices in principal cities the world over

FOR CANADA REFER—CANADIAN INGERSOLL-RAND, CO. LIMITED, 260 ST. JAMES STREET, MONTREAL, QUEBEC.

Ingersoll-Rand

234-TT

Time Tells The Toncan Story



Installing 2,100 ft. of Toncan Iron perforated drains on a middle western railroad.

YEARS and years of maintenance-free service is the story of Toncan Iron culverts on the railroads.

Easy to handle; no chance of breakage; strength to resist the vibration of passing trains. These are advantages enjoyed by any corrugated culvert.

But Toncan Iron culverts have still another advantage that is true of Toncan alone. The material—iron alloyed with copper and molybdenum—lasts far longer.

Toncan Iron builds up its well-known resistance to corrosion and exposure by the inclusion of copper and molybdenum. These elements give the naturally resistant iron a still further protection against weathering and corrosion.

For permanence at reasonable cost, install Toncan Iron culverts.

CENTRAL ALLOY STEEL CORPORATION, Massillon, OHIO

Makers of Agathon Alloy Steels

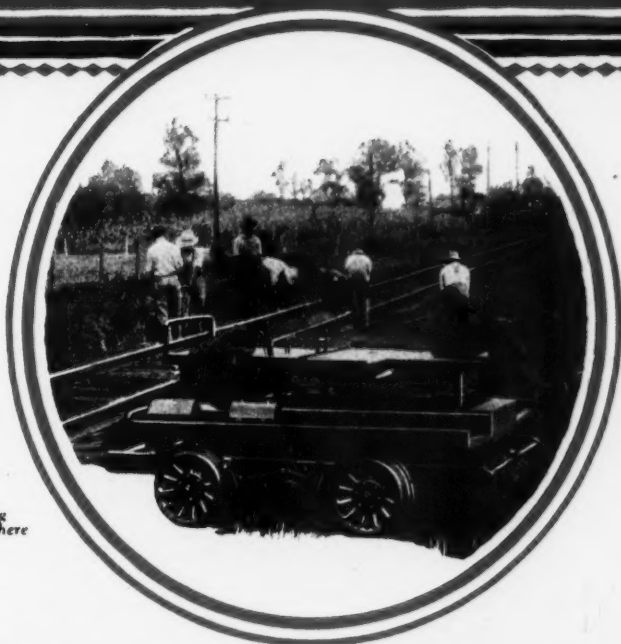
Following are the makers of Toncan Culverts.
Write the nearest one:

- The Berger Manufacturing Co.
Roanoke, Virginia
- Tri-State Culvert Mfg. Co.
Memphis, Tenn.
- The Canton Culvert & Silo Co.
Canton, Ohio
- The Firman L. Carswell Mfg. Co.
Kansas City, Kan.
- The Berger Manufacturing Co.
Minneapolis, Minn.
- The Berger Mfg. Co., of Mass.
Boston, Mass.
- The Philadelphia Culvert Co.
Philadelphia, Pa.
- The Berger Manufacturing Co.
Dallas, Texas
- The Berger Manufacturing Co.
Jacksonville, Florida.
- The Pedlar People Limited,
Oshawa, Ontario, Canada

Cleveland	Detroit	Chicago	New York	St. Louis
Syracuse	Philadelphia	Los Angeles	Tulsa	
Cincinnati	San Francisco	Seattle		

TONCAN IRON

*When the sun is shining
and the gang's all there*



The motor cars that set new standards

Starting first, Sheffield cars have held their lead largely because they represent quality and workmanship that can always be relied upon.

Each adaptable development in automotive engineering has been incorporated in Sheffield cars as soon as its advantages were definitely established.

That is why you find such features in Fairbanks-Morse

cars as three-point suspension, automobile-type pressed steel frames, everlasting clutch, Ricardo cylinder heads, Timken taper roller bearings and other advanced features.

So complete is the Sheffield line that you need not accept cars of inferior quality in meeting any of your requirements for motor cars, hand cars, push cars and velocipedes.

FAIRBANKS, MORSE & CO., Chicago

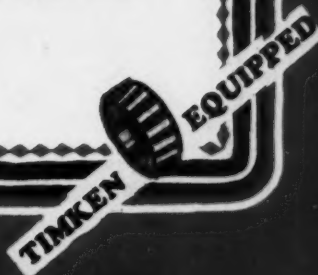
Manufacturers of railway motor cars; hand cars; push cars; velocipedes; standpipes for water and oil; tank fixtures; oil engines; steam, power and centrifugal pumps; scales; complete coaling stations.

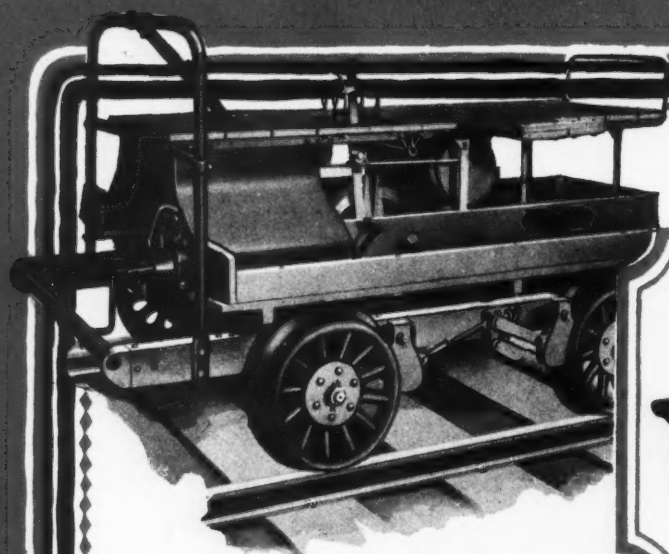
FAIRBANKS-MORSE

MOTOR CARS

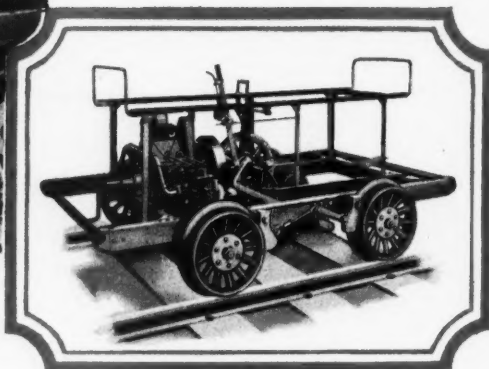
First on the rails

and still first





Strength with lightness—that is the advantage of the pressed steel automobile-type frame. Note trim, compact, well-designed power plant and transmission.



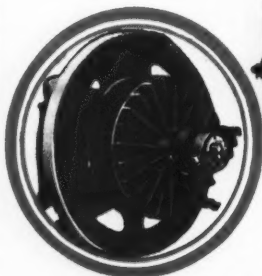
The Sheffield "40-B" —all that a fine car should be

The still higher development of an already highly developed car—that is the "40-B." Its two-cylinder, air-cooled motor gives everything that can be demanded of a motor car—abundant power; exceptional torque at slow speeds; maximum economy of fuel and lubricant.

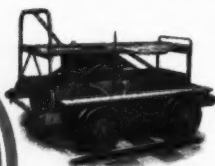
Three-point suspension assures perfect

alignment. Friction transmission is highly perfected. Timken taper bearings on both crankshaft and axles minimize wear and absorb thrust.

In every detail the Sheffield "40-B" is built to more than withstand the most trying service to which a railway motor car can be subjected!



This simple multiple-disc clutch, with large surfaces and cooling fins that dissipate the heat, is one of the greatest single advancements in motor-car construction.



The Sheffield "44" with the perfected clutch chain drive

No car ever won popularity more swiftly than did the Sheffield "44." To the railroad world it brought a one-cylinder water-cooled car of universal utility

equipped with positive chain drive made possible by a clutch that cannot be burned out.

The advantage of this form of drive, as compared with belt drive, was bound to bring immediate recognition. It did away with delays while repairing belts. It eliminated the sliding base and tugging at tension levers. And it substituted for these disadvantages a clutch that is velvety in action and positive when engaged.

Like most other Sheffield motor cars, the "44" has a pressed steel automobile-type frame. Ask for detailed information.

FAIRBANKS-MORSE MOTOR CARS

First on the rails

and still first

ARA21.15



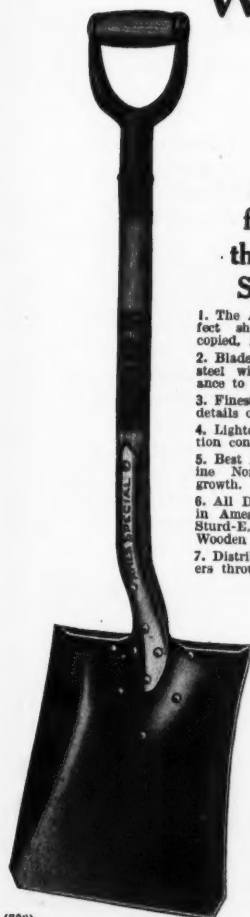


Workmen know the difference with AMES SHOVELS

7

reasons for using the AMES SHOVEL

1. The Ames Bend—the perfect shovel balance; often copied, never duplicated.
2. Blade of heat-treated alloy steel with maximum resistance to wear.
3. Finest craftsmanship, as details of finish readily prove.
4. Lightest weight construction consistent with strength.
5. Best handle known, genuine Northern Ash, second growth.
6. All Dee-Handles, supplied in Ames Split Dee, I-D-L, Sturd-E, Wright Metal or Wooden Dee.
7. Distributed by best dealers throughout the world.



(700)

Sand, gravel, cinders, ballast and dirt are handled more easily with AMES shovels. The thin, highly tempered steel blades and the perfectly balanced, well finished handles give the worker a shovel that's easy to work with.

The AMES bend in the handle, a perfected AMES feature, makes it easier for a man to fill his blade to capacity—oftener.

The blades are fabricated from Alloy Steel of special analysis and so treated to resist wear and distortion to a degree unequalled by any similar tool.

AMES shovels are not expensive, but it is their ability to withstand continued use—even abuse—without showing signs of wear that make them the economical shovels for maintenance work.

The illustration shows AMES Riveted-Back Track Shovel with step and Sturd-E Handle. AMES Track Shovels are made in many patterns

*See our exhibit at Booth 186
at the Coliseum*

AMES SHOVELS

SHOVELS - SPADES - SCOOPS

At good supply houses everywhere

AMES SHOVEL & TOOL CO., Ames Bldg., Boston

Owner of Oliver Ames & Sons Corporation, North Easton, Mass, Established 1774



Replace That Costly Trestle With an ARMCO Culvert

RAILWAY officials have found that greater safety and economy can be obtained by replacing trestles with Armco culverts. Diameters up to 108 inches give ample capacity for the average small stream requirement. Larger capacity is secured by using two or more culverts side by side.

Armco culverts in the larger sizes give the same economies that have made them the preferred drainage structure for the smaller openings—

1. Low cost of transportation and handling
2. Speed and simplicity of installation
3. Freedom from repairs
4. Ample strength—no breakage

5. Great durability—low cost per year of service

Once installed an Armco culvert may be forgotten—there are no repairs, no painting, no maintenance expense, no constant watching, no hidden dangers.

The replacement of trestles is only one of many practical applications of Armco culverts in the railway field. This sturdy pipe is equally advantageous for small bridges, to protect embankments for grade crossings and wherever pipe is required to carry drainage water economically and without attention. Full information on these various uses will be supplied on request. Or an Armco engineer will gladly make recommendations on specific requirements. No obligation.



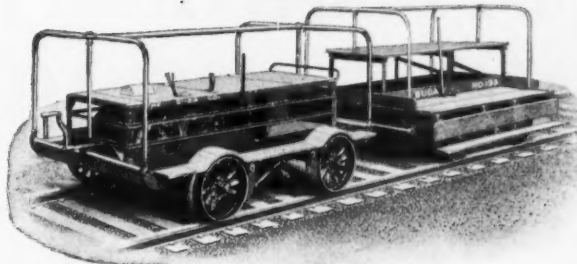
ARMCO CULVERT MFRS. ASSOCIATION
MIDDLETOWN, OHIO

ARMCO CULVERTS

Consistent performance—because of consistent uniformity



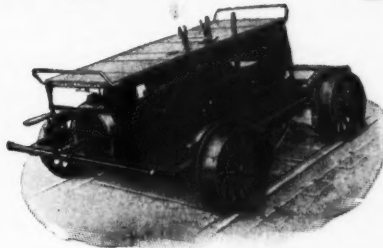
Buda Friction Driven Railway Motor Cars, based on performance over a period of years, combine lowest maintenance with economical operation together with correct design and a high standard of quality.



You Purchase Buda Friction Driven Railway Motor Cars with entire confidence in a product borne of sound engineering and fully sustained by its record of successful performance.

No. 19-L. Heavy-Duty Motor Car with Buda Trailer
Capacity Motor Car12 or more men
Capacity, Trailer.....25 men

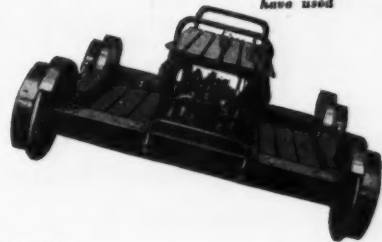
The BUDA No. 219
two to six man type
steel frame — friction
drive



The "Dependable Nineteen" Series

Free Running
Friction Driven
Five Speeds
Forward
and
Reverse
Ample Power for
Trailing Load

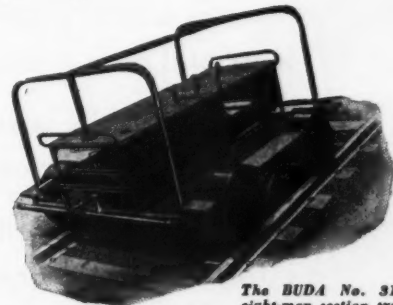
The New BUDA No.
419 — truly a "center
load" car. Ample power
and strength, and
as yet the easiest car
to handle you may
have used



Reliable motor cars under varying conditions of load, grade, climate and altitude for the safe handling of railway forces at speed consistent with "Safety First" requirements.



The New and Powerful No. 119 BUDA — a proven car and worthy "big brother" of the famous BUDA No. 19-L



The BUDA No. 319 eight-man section type steel frame — friction driven ample power for trailing load

The Largest Manufacturer of the Most Complete Line
of Railroad Materials and Track Supplies

THE BUDA COMPANY

HARVEY (CHICAGO SUBURB) ILLINOIS
NEW YORK. CHICAGO. ST. LOUIS. ATLANTA. SAN FRANCISCO. LONDON

THERMIT RAIL WELDS ELIMINATE THE JOINTS

Rail joints when buried in pavement at highway crossings, in station platforms or in tracks located on public highways are a continuous source of trouble and expense. The rail in such tracks usually has a very short life due to joint failures. All of these difficulties can be forgotten once and for all if the rails are Thermit welded.

This method of welding has been used by most of the progressive electric railways in the United States for many years and now is in use on several of the important railways.

The cost of a Thermit weld is slightly more than that of a bolted joint but the first cost is the last cost and the result is a solid continuous rail. There are no bolts to get loose and no joints to cup and pound.

The process is simple, the equipment light and inexpensive, and your own track men can do the work.

We would be pleased to furnish you with complete information in regard to the process and estimates of the cost of installation.



The First Cost Is the Last Cost



METAL & THERMIT CORPORATION

120 BROADWAY, NEW YORK, N.Y.

PITTSBURGH

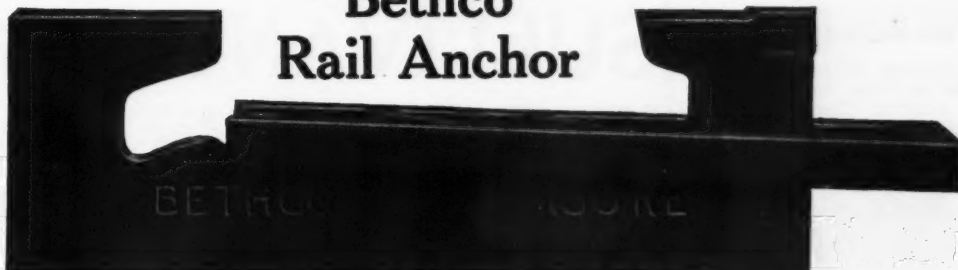
CHICAGO

BOSTON

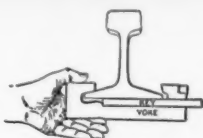
SOUTH SAN FRANCISCO

TORONTO

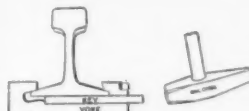
"Bethco" Rail Anchor



Hook long ear of yoke
on rail base



Raise Anchor level with
rail base



Drive key until only $\frac{1}{4}$ "
of key slot shows beyond
the yoke

Bethlehem Railway Track Equipment

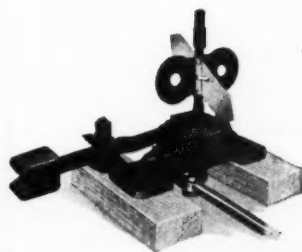
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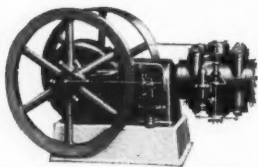
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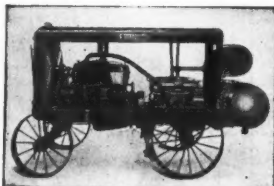
The "WG-6" type shown above, is simple and reliable for continuous service. (Bulletin 1983-B.)



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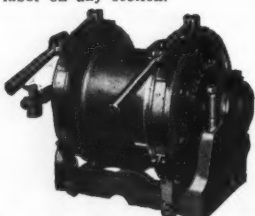


SULLIVAN PORTABLE HOISTS are built in air, steam or electric, single or two drum models, 6½ H. P. They have 2000 lb. capacity on vertical lift, or will pull a 50-ton car on level track. They can be used for spotting cars, handling rails or ties, on derricks, etc.



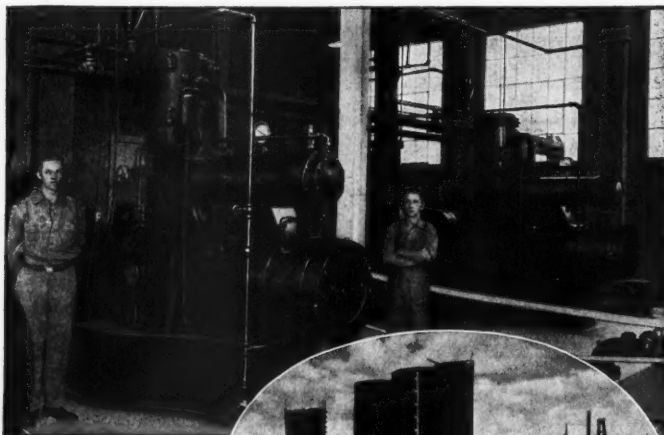
Sullivan 220-ft. Portable Air Compressor, Gas-engine Drive

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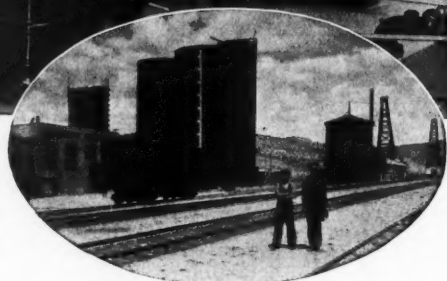


Sullivan Turbine Air Portable Hoist

SULLIVAN Air Lift for Railway Water Supply

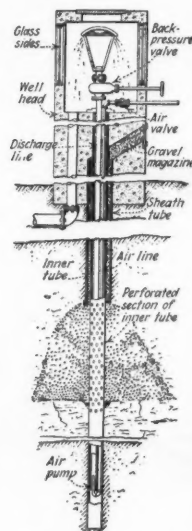


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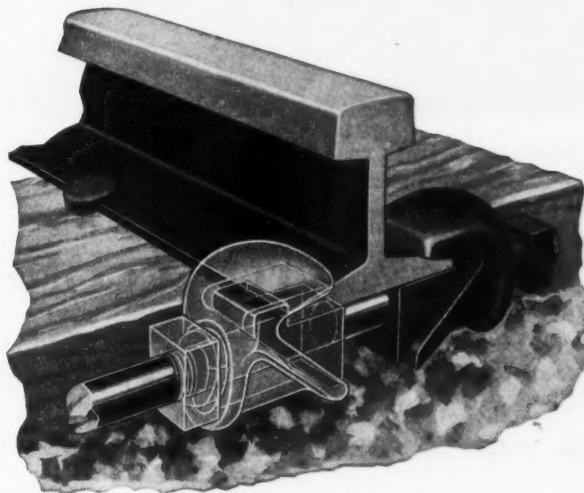
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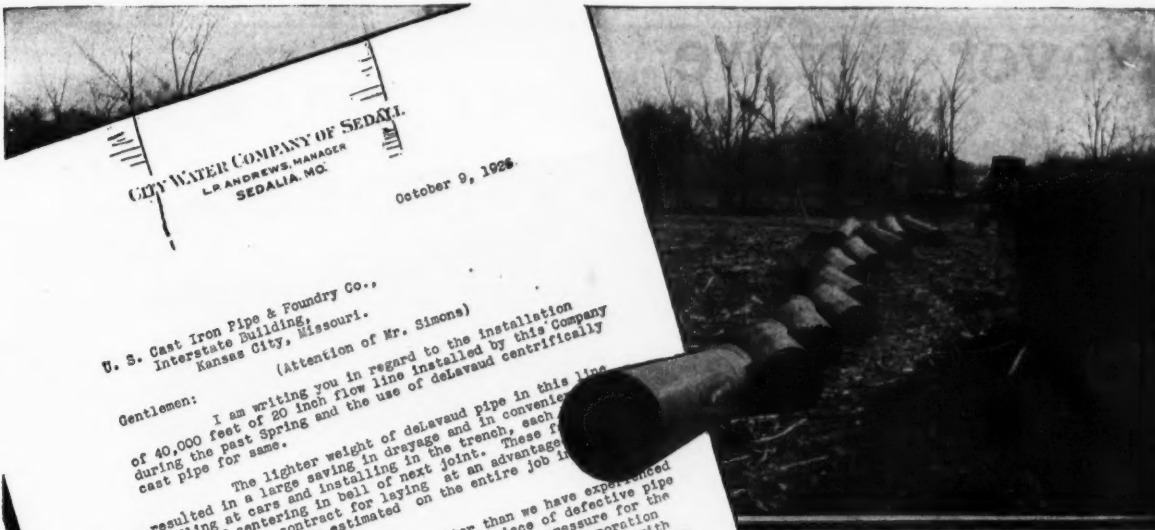
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October 9, 1926.

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(Attention of Mr. Simons)

Gentlemen: I am writing you in regard to the installation of 40,000 feet of 20 inch flow line installed by this Company during the past Spring and the use of deLavaud centrifugal cast pipe for same.

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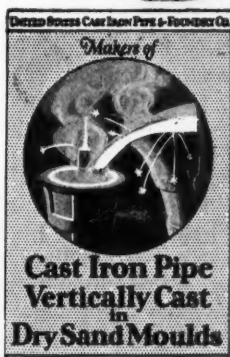
This, our first experience with deLavaud pipe, leads us to believe its advantages over the heavier and more expensive a revolution in water mains installed hereafter.

Altogether we consider we have a splendid installation in this flow line and that it is off our minds henceforth and forever as far as maintenance is concerned.

Yours very truly,
L. P. Andrews
CITY WATER COMPANY OF SEDALIA
Manager.

LPA:MB

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Centrifugal pipe at Sedalia.
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—“Altogether we consider we have a splendid installation in this flow line and that it is off our minds henceforth and forever as far as maintenance is concerned.”

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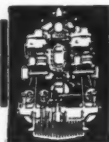
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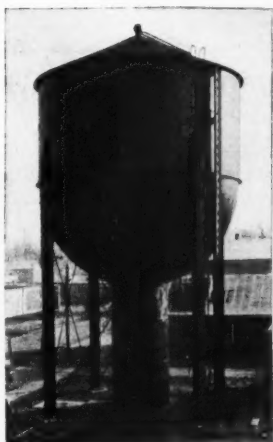
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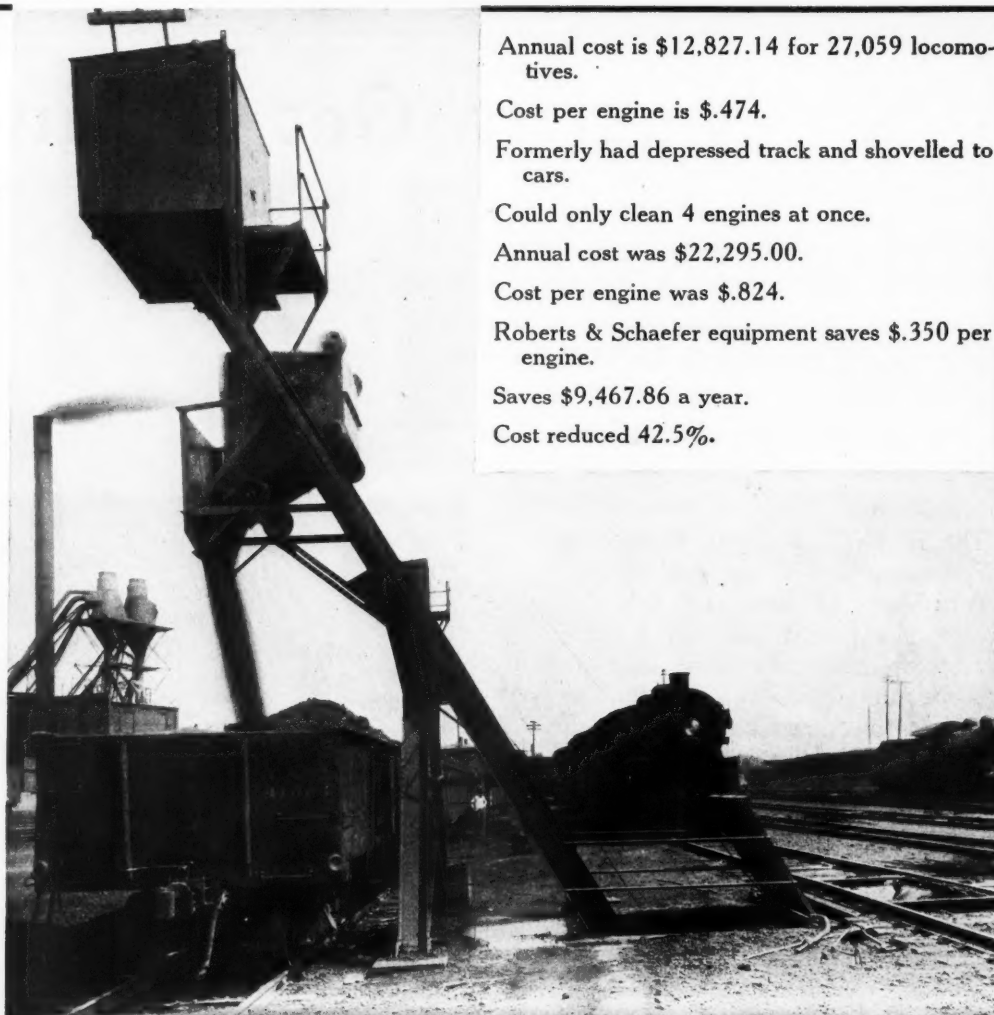
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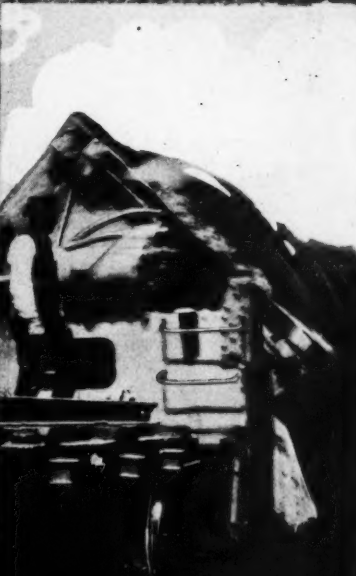
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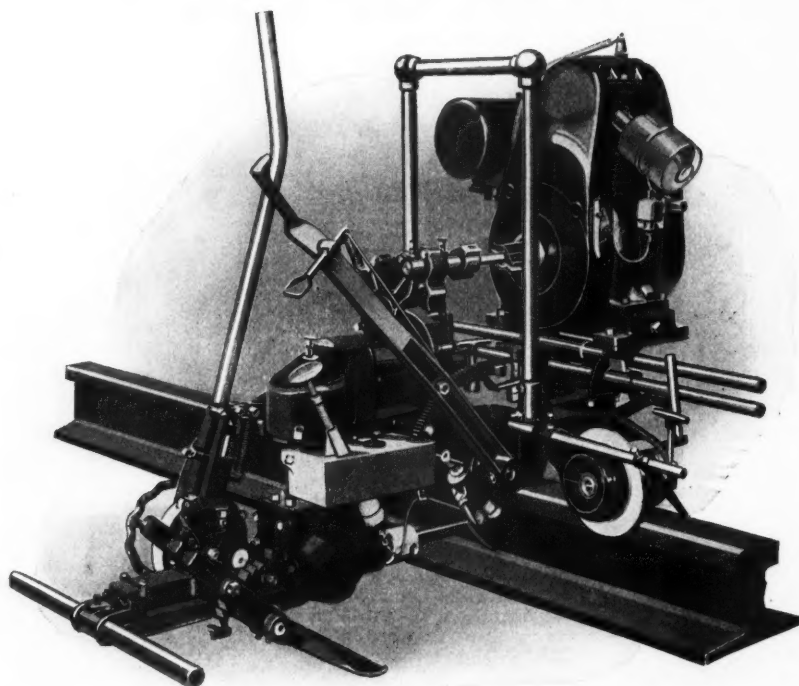
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Railway Engineering and Maintenance

Volume 23

March, 1927

Number 3

THE QUESTION OF EXTRA GANGS

THE question of the relative advantages of extra gangs and of section gangs for performing certain kinds of maintenance work still excites as much discussion as it has occasioned in the past, and recent developments, by introducing new conditions, have led to new lines of thought, even though they have not yet settled the matter one way or the other. There is much to be said on both sides of the subject and most of it has been said not once but many times.

Out of all this discussion good has come and it is less the practice at the present time to decide off-hand that one kind or another of track work must perforce be done by extra gangs. Instead, local conditions are studied and the question of using such gangs is decided only after a thorough canvass of all the elements bearing on the work. Thus we find that some roads favor winter work largely because it enables them to keep their extra gangs intact, while others have adopted winter work because it enables them to lay rail in the winter by bunching their section gangs, thus doing away with the need of extra gangs. Still other roads whose lines traverse both the mountains and the low lying deserts find the solution in moving their extra gangs from one region to the other so that they may keep them employed constantly where climatic conditions impose the least handicap on physical efficiency.

There still remains the long-mooted question as to the quality of work done by extra gangs, but there is no question that permanent gangs can be more easily trained to perform their work in accordance with the company's standards than is possible with gangs which are recruited every spring and disbanded every fall.

MORE EQUIPMENT AND LESS LABOR

UP TO the present time standards of railway construction have been based primarily on immediate necessities with only secondary consideration to ultimate economy. This has been due largely to the rapidity of railway development which has taxed the ingenuity of maintenance officers to strengthen their tracks and structures proportionate to the increase in the loads placed on them. Safety has at all times been the primary consideration and it has frequently taxed the resources of the roads to provide this.

There are now some indications that a new era may be opening for the railways, a period in which more thought can be given to economy in maintenance and to the further improvement of the property in ways that will reduce costs. This is not a new idea for it is exemplified in the substitution of

the treated tie for the untreated tie, which costs more at the start but effects economy in the end, although even here, the most rapid adoption has occurred only in the last few years. In general, however, developments in this direction may now be said to have hardly started.

It is in accordance with the theory that "it is economy to spend money to save money" that the justification of labor saving equipment is found. Equipment costs money and a full complement adds very materially to a railway's investment and to the fixed charges resulting therefrom. Yet if this equipment reduces the cost of work by decreasing the amount of labor required sufficiently to more than offset the fixed charges, economy results and net earnings are increased.

It is not too much to expect that the next few years will see a marked reduction in the number of men required to maintain tracks and structures by reason of their replacement with machinery. The rapidity with which this will come depends upon the ingenuity of manufacturers in adapting equipment to railway operations. It depends to an even greater extent on the ingenuity of railway men in utilizing this equipment in such a manner that the greatest returns will be secured and its use extended thereby.

PROPER INTRODUCTION NECESSARY

IN installing a new unit of labor-saving equipment on a railway, it is not enough that its value shall have been demonstrated to the satisfaction of the officers in charge of the maintenance of way department. Neither is it sufficient that its practicability be demonstrated on other roads. No machine is of value to a road unless it is used on that road and its value to that road is measured by the extent of its use on that road. It is essential, therefore, that after a road invests in labor-saving equipment, it take the necessary measures to insure that the equipment is used.

Although frequently neglected, this precaution is important for several reasons. In the first place, all men, whether general officers or men in the ranks, are creatures of habit and the line of least resistance is in the direction of past practices. It is natural, therefore, for one to react against new methods which require changes in habits. Failure to recognize this trait accounts for more than one failure of equipment.

Not infrequently a supervisory officer makes the mistake of sending equipment from headquarters to a division without the solicitation of the officers on that division and they in turn forward it with equal disinterest to a gang with orders to use it. With no instructions regarding the operation of the machine

other than perhaps contained in a booklet sent with the unit from the factory, it is used improperly or, being new, requires adjustments which it does not receive. As a result it is soon reported as a failure and the men return to their old practices.

On the other hand, the roads that have attained the greatest success in the use of equipment prepare their men in advance for its favorable reception on its arrival. They discuss its value with the men who are to use it before it is ordered and stimulate a desire for it among these forces. Then when the equipment arrives it is accompanied by some one familiar with its operation, who trains the foreman and his men in its use, shows them the precautions to be taken and instructs them in first-aid measures to correct minor difficulties. Under such auspices and particularly with it in sympathetic hands a device is well started on its road to success.

Simple and self-evident as these measures are they are often neglected and as a result the investment made in the equipment is inactive, if not a total loss, while the progress of a meritorious device is retarded elsewhere by reason of its reported failure here. This situation is so prevalent that not a few of the manufacturers maintain "service" organizations to make good this lack of attention on the part of the railways and to forestall unwarranted failures of their equipment. Valuable as this service is to the railways, no road that has made an investment in equipment should depend upon outside assistance. In other words, no road can afford to overlook the importance of "following through" with its investment.

WHY A LABOR SAVING NUMBER?

THIS IS the seventh annual Labor Saving Number of *Railway Engineering and Maintenance*. Each has been larger and more indicative of the progress in this field than its predecessor. Through these years their pages have afforded a progressive record of the change that is occurring in maintenance practices.

New conditions are demanding new methods. The greatly increased wage rates since the war, the radical change in our sources of labor following the restriction of immigration and the greatly increased demands on tracks and structures by reason of the heavier traffic are focusing attention on the necessity for new methods. They are demanding either a reduction in the number of men employed, or more commonly, the performance of more or better work with the same force. Either alternative calls for mechanical aid—labor saving machinery and tools.

One need only glance through the editorial and advertising pages of this issue to realize that maintenance of way methods and standards are undergoing rapid and drastic changes. Practices that were standard only a few years ago are obsolete today, while those of a generation ago are forgotten. Yet a glance into the future promises still more marked changes, and leads to the inevitable conclusion that we have only started to develop the possibilities in the substitution of machinery for man power.

The railways have long been extravagant in their use of labor. Habits of long standing, acquired when there was a surplus of cheap labor, have been continued after that surplus has been exhausted and its cost increased. Other industries have recognized this change by adding largely to their investments in equipment designed to replace men, with the result that the percentage of their operating expenses

going for labor has been cut as much as half in some instances. The railways have only recently made an active start in this direction and while progress has already been made, it is reflected to date only in retarding the increase in force that would otherwise have been necessary to overcome the wear and tear of traffic, rather than being evidenced by an actual decrease in the labor requirements.

To promote this development by bringing new devices and materials, and important improvements in old devices to the attention of railway men is an objective of every issue of *Railway Engineering and Maintenance*. The bringing together of a large number of these developments of the past year and focusing attention on them at this season is, however, of particular service to railway men as they are in the process of formulating their working programs for the season. Since any unit of equipment is of value only as it is used to the best advantage, we also endeavor to bring together in this issue the experiences of those roads which have given special attention to the development of one phase or another of the use and care of labor saving equipment. Through these means we are trying to aid railway men in reducing their maintenance costs by the use of those kinds of equipment that have demonstrated their practicability and to encourage the development of other equipment for tasks still performed by hand. That we may be succeeding to at least some small degree is indicated by a letter recently received from the engineer maintenance of way of one of our largest railways in which he said that "The annual labor saving issue of *Railway Engineering and Maintenance* has had a large part in bringing about increased labor efficiency, extension of the use of labor saving devices, etc., and I shall be glad to read the contributions in the coming March issue on this very important subject."

These are the reasons for the labor saving number.

ECONOMY IN ADEQUATE CLERICAL HELP

ANYONE who has attempted to ascertain definite unit costs of ordinary track work from the average records knows the difficulties attendant on such an effort and can endorse the position taken by C. A. Morse, chief engineer of the Chicago, Rock Island & Pacific, in his address before the last annual meeting of the Roadmasters' and Maintenance of Way Association, which was published in the October, 1926, issue of *Railway Engineering and Maintenance*. This address struck straight at the heart of the matter in its plea to put the track department on a business basis.

In striking corroboration of Mr. Morse's recommendation for providing the roadmaster with a clerk was a letter to the editor, published in the January, 1927, issue, from one who is on the firing line and who has a keen appreciation of the importance of the subject. The picture he presents of the impossibility of doing the work as it should be done under the conditions and limitations that are almost universal is familiar to all whose duties or inclinations lead them to take an interest in the subject.

"Getting things done" is an important part of the track department's job, but it is equally important that the things be done economically. Economy is a relative term and does not imply a cheese-paring policy which may be far from economical in the true sense of the word. The bookkeeping end of maintenance is often regarded with contempt by the

men in the field, but it is the basis by which efficiency is judged, and it cannot fulfill its true function unless it is based on accurate reports that are trustworthy records of the work performed. It is too much to expect section foremen to be expert accountants, but any corrections or adjustments in their reports should be made by one familiar with conditions who can check up the reports while the work is fresh in the minds of those performing it. The roadmaster cannot do this except in a limited way, and his clerk cannot do it unless he has more than a superficial knowledge of track work and is ambitious to become more than a mere messenger boy.

Granted a clerk has the proper qualifications of knowledge and ambition, he can do much to secure accurate reports and to abstract those reports so that the roadmaster may have a running record of costs on his various sections while the work is in progress. Without such a record, the roadmaster must rely on his observations of the work, and these are often colored unconsciously by the personal equation. Accurate reports, abstracted currently to show comparative costs, will serve as a clinic to indicate the proper correctives; otherwise, they may become merely post mortems and are not always correct as such.

In any proposal involving an increase in payroll an important consideration is the way by which the necessary money may be obtained. This can be accomplished without increasing the payroll by adopting Mr. Morse's suggestion that any roadmaster without a clerk will agree that he can do more and better work on his division if he can substitute a competent clerk for two laborers, whose pay will enable him to secure such a clerk. But too often the search for a clerk with the proper qualifications is similar to the quest of the panhandler who asked a passerby where he could get a good meal for a dollar. On being told, he inquired, "Now, can you tell me where I can get the dollar?"

A NEW DEPARTMENT

ONE OF the results of the rapidly increasing use of labor saving equipment is a growing realization of the necessity for the creation of an organization to supervise its selection, operation and maintenance. Until recently, most of the railways have handled this work as a series of individual problems and have given it no concentrated attention. As a result numerous losses have been allowed to creep in, in the form of unnecessarily high costs of maintenance, incomplete utilization of equipment, etc.

The investment in labor-saving equipment is becoming so large and is increasing so rapidly that it is essential that the railways secure the maximum return from it. Because of the expenditure it is important that the roads know at all times that this equipment is being maintained as economically as possible consistent with maximum availability for service, and that it is being used in the way that will yield the largest return, not only by its most efficient use when in operation but also by seeing that it is employed as steadily as possible throughout the year. It is also important that some one trained in the possibilities of equipment of this character be available for the investigation of new devices as they appear. This suggests the concentration of responsibility for supervision over labor saving equipment in the hands of a single man, preferably on the staff of the engineer maintenance of way, whose duties would include the initiation of recommendations for

the purchase of equipment, the distribution of this equipment to the various divisions and subdivisions and the supervision of its use on these divisions to insure that the local forces employ it to the best advantage.

Of late a number of roads have gone to a modified form of this organization by concentrating the repair of their work equipment under a single maintenance officer. In general this has started first with the maintenance of motor cars. When the number of cars operated was small and the work to be done on them limited, this work was very naturally referred to the mechanical department. But with the increase in the number of cars and in the amount of attention required by them, one road after another has realized the economy of concentrating this work in special shops provided with equipment selected directly for the work to be done and manned with specialists. Indicative of the economies that are possible through such an organization, one road of moderate size reduced the cost of its motor car maintenance nearly \$50,000 in the first year after the reorganization of this work.

Of even greater importance is the supervision of the operation of equipment to insure that it is not abused unnecessarily, that it is employed in the way that will yield the maximum returns and that it is so distributed as to do the maximum work throughout the year. Much equipment, such as motor cars, can be assigned permanently to individual gangs, while other equipment, such as rail laying machines, can best be utilized by moving them from one division to another as the work warrants. Even where equipment is assigned permanently to a gang, however, there is vast opportunity for improvement in its service by seeing that the men using it are properly instructed in its operation and in its possibilities.

There is also another important phase of this problem. On many roads it is the practice of executive officers to require all recommendations for expenditures to be accompanied by estimates of the economies to be realized from these expenditures. This requires those originating the recommendations to study the economics of their proposal closely. All too frequently labor-saving equipment is purchased after insufficient investigation, with the result that economies are predicted which cannot be realized. An officer concentrating on the use of labor-saving equipment should be better qualified to pass upon the merits and possibilities of a new device than one whose attention has been attracted to it more or less casually and whose recommendations are based on impressions rather than definite knowledge.

A railway is warranted in investing in work equipment only to the extent that this equipment pays. It can be made to pay largest returns only by concentrating trained supervision on it in all of its stages from first consideration through its purchase, assignment to specific tasks, operation and maintenance. The nature and magnitude of these duties warrant a specialist. The time is coming on many roads, and is already here on others, when maintenance of way officers can well afford to consider the creation of such a department.

THROUGH FREIGHT SERVICE ESTABLISHED.—The Chicago & North Western, in conjunction with the Litchfield & Madison, has established a daily freight service between East St. Louis, Ill., and points on the North Western's lines to the north and west.

What Our Readers Think

THE CUT SPIKE REMAINS

Central West.

TO THE EDITOR:

Having been in very close contact with our railroads for a quarter of a century, I have had ample opportunity to notice the wonderful improvements that have been made in all the different branches. Riding thousands of miles over various roads, I marvel at the engineering skill that has been displayed.

What has struck me most forcibly, however, is the fact that while our railroads have improved everything pertaining to their business, there is one object that has never been molested. It is just as rough and just as crude now as when first used by our grandfathers, who by the sweat of their bodies, drove them home then as now. I refer to the track spike. Why in the name of all progress do the railroads continue to construct costly roadbeds, lay heavier rails, install tie plates, treat their ties, install signal systems, build heavier equipment and still use a relic of antiquity which really is all out of harmony with present day methods. We dare say that much of the maintenance expenditure, both in tie renewals and track maintenance, that is spent year after year is due directly to a weak rail fastener.

C. E. SEMLOH.

SAND VERSUS EXCELSIOR FILTERS

Chicago.

TO THE EDITOR:

I have read with considerable interest the discussion brought forth by the question on excelsior filters for water treating plants, answers to which appeared in your January issue, followed by a letter to the editor in the February issue. It is not my desire to make this a three-cornered controversy, but rather to act in the role of a peace-maker, at the same time airing a few views of my own.

I agree with both Dr. Barr and Water Engineer on certain points and disagree with them on others. While I cannot agree with Dr. Barr that excelsior is the most satisfactory filtering medium for water treating plants, it is a fact that it is proving satisfactory in many cases. Sand is undoubtedly the best filtering medium available and while it is admittedly more expensive in both first cost and in cost of filter maintenance, in nearly every case the additional cost is justified by the results obtained, which are measured by the quantity of matter removed by the filter.

The removal of matter from treated water by passing it through a filter is accomplished in two ways: (1) through the straining action of the filter, and (2) by what is commonly termed adsorption. The first process merely means that the filter collects and retains particles that are too large to pass through the interstices of the filtering medium, the second, that particles are caught by the filtering medium through adsorption, even though they are small enough to pass through the interstices with the water.

Excelsior and sand filters accomplish both of these processes, but it is obvious that the interstices in the sand bed are finer than in a bed of excelsior and naturally more sand surface is exposed, with the result that the sand will collect smaller particles and at the same time have a greater power of absorption.

One of the largest manufacturers of railroad water treating plants building both sand and excelsior filters, makes the following statement regarding excelsior

filters: "While this type of filter is satisfactory in many cases it cannot deliver a clear water at all times. When the filter material is first placed, the bed is a fair filtering medium but as the wood fibre becomes soaked with water it swells and opens up small holes through the bed which allow part of the water to freely pass through the filter. This at times causes the water to be slightly cloudy with light precipitated ingredients which will not settle."

The efficiency of both sand and excelsior depends largely upon the rate of flow through the filter. It is apparent that a sand bed will permit a much higher rate of flow than an excelsior bed of the same thickness; therefore, to equal the efficiency of a sand filter it is necessary to make the excelsior filter bed much thicker and to materially increase the area in order to reduce the rate of flow. Dr. Barr calls attention to this feature in discussing the subject and also stresses the fact that care must be used in the preparation of the excelsior filter bed.

In criticising the excelsior filter Water Engineer has apparently fallen into the common error of assuming that filtration of treated water is resorted to only to correct poor filtering conditions in a treating plant.

I heartily agree with Dr. Barr that no water softener within reasonable cost has yet been designed that will completely and efficiently remove all suspended matter without after-filtration. This is proven in the case of municipal plants where filtration is necessary to clarify the water even after 24 and 30 hours settling time.

Water Engineer is correct in the statement that many excelsior filters have been removed from treating plants and that others are retained merely to avoid controversy with operating officers and engineers, but it is safe to say that in every case where they have been removed it was because their benefits were not appreciated or for the reason that they were improperly installed and maintained.

Many filtering mediums have been employed in filtering treated water, among which are stone, culm, charcoal, sponge, sand, excelsior and others too numerous to mention. Of these only two have survived the test of time, namely, excelsior and sand, and while the writer is firmly of the opinion that a sand filter is the most efficient and satisfactory he also believes that the excelsior filter, properly installed and maintained, will fully justify its cost in every case.

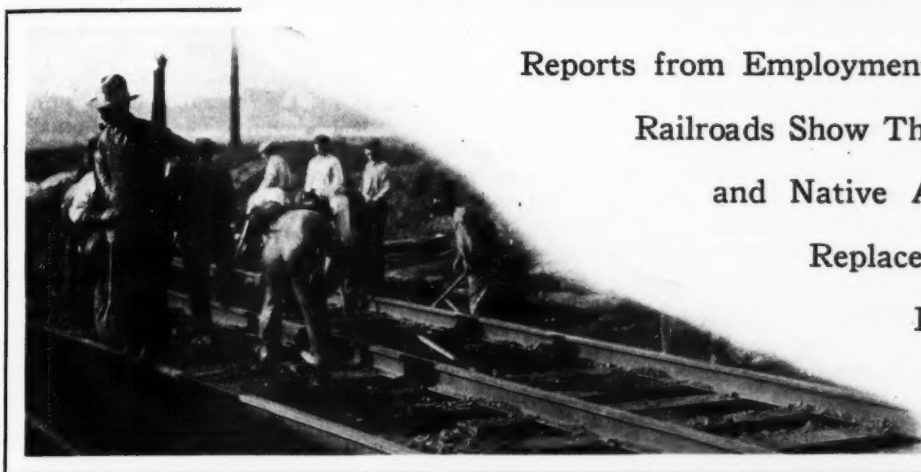
C. R. KNOWLES,

Superintendent Water Service, Illinois Central.



Track Laying on the Union Pacific in Wyoming

Where is our Labor Coming From?



Reports from Employment Agencies and
Railroads Show That the Mexican
and Native American Have
Replaced the European
Immigrant

WHERE is railroad maintenance of way labor coming from? That it is coming from somewhere in sufficient volume should be entirely clear, for with a few minor and distinctly local exceptions there was no shortage of labor during the unusually active season of 1926. Nevertheless, the question deserves an answer because any study of current conditions, predicated on the history of maintenance of way work, would lead to the conclusion that there should have been a severe labor shortage last year. Why was this not the case?

From the earliest days of railroading, it was the custom of the roads to recruit their extra gang laborers from among European immigrants in this country. The only important exceptions to this rule are found in the south where negro labor has always been employed and in the west and southwest where the Oriental and the Mexican have been important factors in labor supply. When the supply of Irish, Scandinavians and Germans proved inadequate, the railroads employed Italians and finally men from the Balkan states and other parts of eastern Europe. But with the outset of the European war this abundant flow of European labor dwindled. For a time it ceased entirely and at present it is but a fraction of what it had once been. Yet in spite of this fact and the high rate of industrial activity which has prevailed throughout the country, the railroads were able to carry out unusually large programs of construction and maintenance operations last year with almost no interference which could be accounted for by a lack of sufficient labor.

Decrease in Immigration

The marked decrease in the rate of immigration is illustrated in the immigration tables presented in these columns. Thus, from 1910 to 1914, a period of five years, Europe supplied us with Bohemians, Bulgarians, Croatians, Greeks, Italians, Lithuanians, Poles and Russians to a total of 1,933,810; while in the 2½ years from July, 1924, to December 31, 1926, 43,278 more persons of these races actually returned to Europe than arrived from the old world. Expressing these facts in yearly averages the *net* immigration per year into this country from eastern and southern Europe was 386,762 during the five years 1910 to 1914, whereas the *net* emigration to the same parts of Europe in the last 2½ years was at the rate of 17,311 persons per year. How-

ever, the loss of actual man power is even greater than these figures indicate. The statistics for net immigration are determined by subtracting the total number of persons, including women and children, who left the country from the number who entered, but the Bureau of Immigration points to the significant fact that, whereas the number of immigrants is about equally divided between males and females, the emigrants include about three times as many men as women.

It is true that the average immigration is still one-third as large as in former years in spite of the drastic limitations established by the Immigration Act of 1924. But the significant point is that there has been a marked change in the races of people making up a total. Take, for example, the three nationalities that were once the chief source of common labor on the railroads, the

Net Immigration or Emigration by Selected Races

	Fiscal Years Ending June 30					
	Totals 1910-14	Totals 1915-19	Totals 1920-24	1925	1926	Second Half 1926
Bohemian	41,961	1,612	9,578	295	1,026	780
Bulgarian	24,334	1,013	28,560	1,323	1,149	565
Croatian	103,213	428	8,213	247	100	214
English	219,451	100,215	250,452	41,472	37,271	19,629
German	296,510	40,500	203,182	49,863	54,166	26,756
Greek	116,154	36,095	7,243	5,591	3,803	600
Irish	164,466	62,628	137,034	41,229	41,250	24,109
Italian	729,447	86,692	230,702	19,956	10,630	2,834
Lithuanian	82,869	2,906	4,650	198	46	57
Mexican	79,154	46,307	227,190	29,503	39,480	28,048
Polish	436,244	8,499	36,868	515	352	857
Russian	103,098	12,935	4,156	338	357	393
Scandinavian	163,475	58,526	112,514	16,335	15,230	7,739
Scotch	94,248	45,321	152,706	24,948	25,386	13,356

Note—Figures underlined show net emigration.

Irish, the Germans and the Scandinavians. During the five years from 1910 to 1914, inclusive, the arrivals exceeded the departures to the extent of 277,677 per year, while during the last 2½ years the net immigration of these three classes averaged 111,071 persons per year, or less than half as many as formerly. But these nationalities have long ceased to be a source of supply for maintenance of way labor. Their numbers are comprised more largely of members of skilled trades who are not, therefore, interested in employment as common laborers for other than the brief period of adjustment necessary for them to locate themselves where they can pursue their chosen avocations.

With immigration to this country from southern and eastern Europe largely shut off and with emigration from eastern and northern Europe of a character that does not include many common laborers, it follows that the common laborers to be recruited from European immigration is decidedly small. This fact is definitely shown by immigration statistics. In the calendar year of 1926, 56,576 laborers were admitted, while 31,128 departed, leaving a net immigration of laborers of 24,448. During the second six months of 1925 there was an actual net loss of 7,778 laborers through emigration. It should therefore be clear from the facts presented above that European immigrants are no longer a factor in the supply of labor for maintenance of way work.

Mexico Only Important Source of Foreign Labor

Europe, however, is not the only part of the world from which the United States draws its immigrants. The Immigration Act of 1924 places no limitation on emigration from countries of the western hemisphere that are not dependencies of European nations or from the Dominion of Canada. However, only two of these countries are sending many people to the United States, namely, Canada and Mexico. During the fiscal year

Total Immigration and Emigration 1912 to 1926

Year Ending	Immigrants	Emigrants	Net Increase
June 30			
1912	838,172	333,262	504,910
1913	1,197,892	308,190	889,702
1914	1,218,480	303,338	915,142
1915	326,700	204,074	122,626
1916	298,826	129,765	169,061
1917	295,403	66,277	229,126
1918	110,618	94,585	16,033
1919	141,132	123,522	17,610
1920	430,001	288,315	141,686
1921	805,228	247,718	557,510
1922	309,556	198,712	110,844
1923	522,919	81,450	441,469
Calendar			
Year			
1923	751,050	70,610	680,440
1924	354,770	90,121	264,649
1925	290,725	81,689	209,036
1926	336,295	73,179	263,116

ending June 30, 1926, the immigration records show that only 91,019 persons were admitted from Canada and 43,316 from Mexico. The emigration to these two countries during the same period was 2,173 and 3,198, respectively. Canadians, however, are not ordinarily a source for any considerable supply of maintenance of way labor.

The Mexican is the one class of immigrant who is making an important place for himself as a track laborer in the United States today. Whereas, it is only a few years since he was employed only on the railroads in the southwest, he is now in service on lines covering a very large part of the entire country. But even the widespread distribution of the Mexicans, which is so readily apparent to the casual observer because of their readily identified racial characteristics, should not cause one to place undue emphasis on the people from our southern frontier as a factor in the labor supply. For example, attention is directed to the fact that the total net emigration recorded from Mexico in the 17 years from 1910 to 1926, inclusive, was only 449,000 or only 60 per cent as great as the emigration from Italy in the five years 1910 to 1914. Obviously the long international boundary line affords opportunity for the entry of some Mexicans not included in the statistics but it is also well to bear in mind that the more general distribution of Mexicans on the railroads in the north and east has also been accompanied by their extensive employment in other industries.

But regardless of whether the railroads get the bulk

of the Mexicans, the number of them entering the United States from year to year is inconsiderable as compared with the great number of immigrants from southern Europe, on which the railroads formerly depended very largely for the recruiting of extra gangs. While they are used very largely for section and extra gang work in the west and southwest and for extra gang work in the north and east, they comprise only a part of the total labor supply. The conclusion to be drawn is that the railroads have been able to obtain a large supply of labor from people long resident in this country. In most parts of the country this implies the native or naturalized white and in the south, of course, the negro.

Agriculture, which suffered more severely than any other industrial activity in this country in the readjustment following the World War, has by no means recovered from the shock. The number of farms, the acreage under cultivation and the farm population, definitely decreased in the five years from 1920 to 1925. It is estimated that there were 3,519,000 less people living on farms in 1925 than in 1920. This reduction is due largely to the abandonment of unprofitable farms but also in some measure, at least, to the gradual increase in the use of labor saving implements.

This marked deflation in agriculture, the decrease in the demands for farm labor and the economic difficulties of those still living on poorly paying farms have restored to the railroads a considerable part of the plentiful supply of native labor on which they formerly depended almost entirely for the recruiting of section gangs. Some railroads now report that it is only during harvest periods that they have difficulty in obtaining an adequate supply of native labor over large portions of their lines. A further evidence of this economic influence, as noted by the labor agencies, is the marked reduction in the annual movement of labor into the western wheat fields during harvest time.

The influence of readjustment in agriculture is also apparent from a study of the supply of extra gang labor. Before the outset of the European war, extra gangs were divided into two general classes, hoboes and foreigners, the latter being generally segregated by races. The use of negroes was confined very largely to the south and the Mexican to the southwest. Since the war the use of the negro and the hobo has continued while the Italian and Greek have been replaced by the Mexican. One Chicago labor agency reports that 60 per cent of the men now shipped for extra gang work are Mexicans. However, the hobo of today is no longer of the well defined type of years gone by. In fact, he can no longer be designated as a "type." Hobo gangs now consist largely of a mixture of what might be termed Americanized foreigners, social misfits who, unlike most of their kind, have failed to establish themselves in a trade, business or other steady employment. But in the last few years the labor agencies have noted a new tendency. Whereas the old time Irish or Yankee hobo has now largely disappeared, he is being replaced in part by boys and young men from the small towns and farms who take up such work as is offered them by the labor agencies, partly because of a lack of familiarity with the opportunities for work in the large industrial centers and partly, perhaps, because of the opportunities that railroad work affords for extensive traveling. This trend is confirmed in reports from a number of roads to the effect that they are now able in certain territories to recruit extra gang labor from local communities by providing transportation for the men to and from their homes each day. But regardless of the variations in the characteristics of the

labor employed in various parts of the United States or the economic conditions which make it available, the fact remains that the supply has been generally adequate in spite of the most remarkable industrial ac-

tivity that has maintained in the United States during the past two years. It is the most profound demonstration of the consequences of the application of labor saving equipment in all lines of industry.

The Problem as a Labor Agent Sees It*

By R. T. HARDING

President, American Boarding & Supply Company, Chicago

THE extra gang laborer and the extra gang foreman still occupy most prominent places in railroad construction. The part taken by these men in railroad construction and maintenance in years gone by has been unequalled by any other class and in spite of the fact that great companies have been formed and great men have used their brains to eliminate labor, without the extra gang labor and the extra gang foreman we would today be at our wits end to know how to carry on the work in which they have been employed.

The term "extra gang labor" means just exactly what it implies. The railroads, in carrying on improvement work, are seldom in a position to utilize their regular maintenance forces. Therefore, when this work comes up, it is necessary to recruit gangs of men for the extra work that they contemplate, and as soon as this extra work is finished, the extra gang labor is dismissed. The railroads seldom concern themselves as to where these men go or what becomes of them.

The Foreman Is the Key Man

In the past 20 years, the complexion of the extra gang foreman has changed a great deal. He was formerly of the Celtic type, a large, blunt and outspoken character. Today he is from the great American melting pot, and is a combination of all, with a noticeable increase of the Slavic and Latin types. The same condition has arisen with the extra gang laborer; the Slavic and Latin types are well mixed with the Celtic. While the Latin type of laborer was formerly one of our principal workers, he has been rapidly supplanted by the Mexican.

Anyone who has been directly in charge of an extra gang will readily admit that a good foreman (meaning one well versed in his trade and who will comply with discipline) is about the most valuable unit in the organization. A good foreman can organize and make a good gang out of very unpromising material, while a poor foreman, or a man who is not well acquainted with his work, gets only mediocre returns from the best of laborers.

The old time Irish foreman who was the natural boss of the gang, and had a knowledge of the work to be performed, has never been excelled. This man eats at the same table with his laborers, lives with them in the crudest of box cars or the best of dwellings, always listens to their many complaints and looks out for them. He also discharges them promptly if they are lax in their deportment. The old foreman took a great pride in his work, his gang and his camp. The extra gang foreman of today is just as exceptional a man, possibly bound down by a few more rules and regulations which have cramped his style, but still the important "cog" in railroad building. The roadmaster who has a force of high

class foremen feels sure that his work will be done, and done in a very efficient manner.

The Laborer Is Changing

The change that has taken place in the extra gang laborer on account of the high wages is beneficial to both the men and the railroad. Drunkenness in the old days was the great curse of these men and although I am inclined to believe that the Volstead act and the Eighteenth amendment are not taken quite as seriously as they should be by this class of men, the limitations placed on the sale of liquor has been of marked benefit to them. Today they are better clothed and fed. In the winter time when a call comes for snow shovellers, we get men fairly well clothed and provided with overshoes, mittens and overcoats, whereas, in former days, the extra gang laborer called to shovel snow, clear the tracks, etc., often reported so scantily clothed and poorly shod that he was in no condition to withstand the rigors of the work.

The labor turnover is influenced to a marked extent by the character of the camps provided for the men. We are building and operating better camps today, from standpoints of both comfort and sanitation, than we ever did. Whoever devised the iron bunk is entitled to a great deal of credit, for it certainly is a decided improvement over the old time wooden bunk, which was rudely constructed and served as a fruitful place for the breeding of vermin. However, there is still much room for improvement in the extra gang camp. One reason for the lack of improvement is the temporary nature of the work and of the quarters provided. I think that some day the railroads will provide sleeping cars for these men that will be a regular part of their equipment.

The extra gang laborer has a nose for news. The way these men impart information as to what is a good job and what isn't, is marvelous, inasmuch as there is no official publication covering it. Oftentimes, without any cause whatever, laborers call for their time slips and leave with intentions of going hundreds of miles away to another job which has been promised them, and which is surely going to be the one job they have always been looking for.

The Foreman of the Future

Where do you get your extra gang foremen from? The young engineering graduate is not of the caliber that will make an extra gang foreman, nor does he feel inclined to do that sort of work. Who are to be the foremen 20 years from now, and from what class are they to come? Are the ambitious men to be discouraged or are we going to recognize the importance of their work and make it possible to place a sufficient value on the job to attract young engineers? Certainly the old time foremen are gradually dwindling away and their sons are not taking their places but are entering other lines of work.

*Abstracted from a paper presented before the Maintenance of Way Club of Chicago on February 10, 1927.



Will We Have An Adequate Supply of Labor This Year?

What Railway Officers Think of the Outlook for 1927, Based on the Experiences of the Past Year

LABOR was available in generally adequate volume for maintenance of way work throughout the United States and Canada during 1926, although there were local shortages in certain localities, primarily during harvest periods. This is the conclusion reached from a study of the replies to inquiries made of railway maintenance officers in various parts of both countries which are presented below. It is also apparent that the answers would have been different if the railroads had not been able to effect a marked increase in the output of work per laborer employed as compared with that which prevailed five or six years ago. Nearly all railroads represented in the replies report a small but definite increase in the efficiency of their laborers, and greater use of labor saving equipment. The influence of these tendencies has not been sufficient to bring about an actual reduction in the total man hours of labor employed but has enabled the roads to accomplish more work with a force substantially no larger than that required during years when maintenance programs were appreciably smaller. The supply of labor during 1927 is expected to be about the same as in 1926, with possible shortages in the industrial and oil regions.

The most significant feature of these reports on labor employment is the marked similarity in the statements relating to the use of labor saving devices. They show that the use of such devices and equipment is on the increase, and that such use has been attended with encouraging results. At the same time they indicate a conservative attitude that will insure against error and failure and thus make for the most consistent results and steady continued progress.

A review of these reports also points to liberal programs of improvement and maintenance work during the coming year. In most cases these are expected to equal if not exceed those of 1926. In fact, the only

exceptions to this rule are to be found on those roads which carried extraordinarily large projects to completion during the past year.

Immigration a Factor in Eastern Canada

By A. C. MacKENZIE

Engineer Maintenance of Way, Eastern Lines, Canadian Pacific, Montreal, Que.

Probably 65 per cent of the labor used for maintenance purposes on the Eastern lines of the Canadian Pacific is local while 35 per cent is supplied to sparsely settled portions of the country from the larger cities. Because of this we find it desirable to handle as much of our betterment work as possible at times when work is slack on the farms and in any event before the harvest in Western Canada draws labor away from the East. Generally speaking, it was possible to obtain an adequate supply of labor during 1926 except at harvest time, although at times it was necessary to increase wages in some localities to obtain it.

No very large railway projects are contemplated for the present year, but there will, of course, be the usual work on tie and rail renewals, ballasting, and other maintenance betterments. In the industrial field a healthy condition prevails and work is in progress on several large hydro-electric projects, pulp mills and other manufacturing plants. Activity is looked for also in the building trades, although no "boom" conditions are expected.

While, generally speaking, the volume of work in 1927 in Eastern Canada is expected to be greater than in 1926, it is not expected that there will be any appreciable shortage of labor as it is expected that the supply in this regard will be kept up by immigration.

The character of labor has not changed appreciably in the last few years, laborers from European countries predominating in those parts of the country where local labor is not available.

The efficiency of our labor has not changed to any extent in the last few years. It is generally found that labor recruited locally is more efficient than imported labor, probably due to the fact that in such there is always a fair proportion of men who have had previous experience with our methods and conditions.

Labor-saving equipment is an increasingly important factor in the handling of all our maintenance work. Development in this connection has been very marked in the past few years and while it would be difficult to determine accurately what effect it has had, as a whole, on the reduction in man power required, running from 10 per cent all the way up to as high as 90 per cent on specific pieces of work, there is no question as to the marked reduction which the use of labor-saving equipment has effected in the amount of labor required for the handling of railway maintenance work. This is, of course, having its very substantial reflection in the cost of the work as well as on the important time factor.

An Ample Supply in the Southeast

By W. D. FAUCETTE

Chief Engineer, Seaboard Air Line, Savannah, Ga.

The Seaboard Air Line operates on the Atlantic seaboard in the territory between Richmond, Va.; Jacksonville, Fla.; Miami and Tampa; Montgomery, Ala., and Birmingham; and Atlanta, Ga., and in the six states of Virginia, North Carolina, South Carolina, Georgia, Florida and Alabama.

During the last year, the labor supply in this territory has been adequate to the demand. It is not possible at this time to forecast the amount of railway construction this year but the volume of maintenance work will be substantial, as it was last year. It is not probable that if the volume of work is increased it will materially affect the supply of labor available.

There has been no noticeable change in the character or nationality of labor in the territory served by our railroad in the last two or three years. Its efficiency is about the same today as during the last two years.

We have not yet purchased sufficient labor-saving equipment to cause any noticeable effect on maintenance labor requirements but whenever possible it is our purpose to supply ourselves with it.

No Shortage Anticipated on C. & O.

By L. B. ALLEN

Assistant to Vice-President, Chesapeake & Ohio, Richmond, Va.

During 1926 the labor supply on the Chesapeake & Ohio was adequate with the exception of one or two points in the West Virginia coal fields and on the Chicago division near Chicago. The work in prospect on the Chesapeake & Ohio is normal for the anticipated heavy business. No unusual programs of work are contemplated and the maintenance program will not include any particularly new features. We anticipate no trouble in getting an adequate supply of labor to carry out the maintenance program which a heavy business justifies.

Throughout its southeastern territory the Chesapeake & Ohio has always been supplied largely with colored labor and on the northwestern end of the line with native white labor. There has been very little change in the

character of this labor in the last few years. There has been a slight improvement in the quality of this labor in the last two or three years as compared with four or five years ago.

During the last two years we have had a great many labor-saving devices and much labor-saving equipment in service, but thus far these devices and equipment have had no material effect on the labor requirements because the heavy increase in business during this time has made it necessary to employ practically as much labor as during the time prior to this period. However, without these labor-saving devices it would have been necessary to draw additional labor, which would probably have resulted in at least a slight labor scarcity in the territory tributary to our lines.

Handling 25 Per Cent More Tonnage Per Man Employed on the L. & N.

By J. R. WATT

General Roadmaster, Louisville & Nashville, Louisville, Ky.

There has been no labor shortage on the Louisville & Nashville. There seem to be prospects of the usual amount of maintenance work and a rather limited amount of construction work which will not be sufficient to affect the labor supply. I have not observed any marked change in our labor which is very good as compared with a few years ago.

Some increase has been made in the use of labor-saving equipment, such as steam ditchers, tie tamping outfits, gasoline-driven cranes, ditcher spreaders and motor cars. A considerable amount of tile drainage is being installed; also piles are being driven and tied together at the top to provide stable roadbed on weak fills. Our records indicate that the use of creosoted ties and labor-saving devices and installations, together with more efficient labor, have enabled us to handle 25 per cent more tonnage per man worked on the track than five years ago.

Mechanical Equipment Has Aided on the Rock Island

By W. H. PETERSON

Engineer Maintenance of Way, First District, Chicago, Rock Island & Pacific, Des Moines, Iowa

We had some difficulty in getting sufficient labor at all times during 1926 on the Illinois and Chicago Terminal divisions and were not able to fill out seven or eight sections to their allowance for several months. Outside of this there was no shortage on the First district of the Rock Island. Our shortage on the Illinois division was through the industrial region where the industries, when going at full capacity, have always taken our labor away. The labor supply has been tightening up since the war, and we anticipate difficulty in getting extra gang labor to take care of any large amount of work that may be anticipated on the Illinois and Chicago Terminal divisions, but we do not expect any difficulty on the rest of our territory.

Prior to the war we employed a large number of Greeks and Italians, and some Austrians in extra gangs, in addition to obtaining labor from Mexico. Since the war the Greek and Italian labor has practically disappeared and we had only one small extra gang of Austrians last year. We are now dependent for our extra gang labor on Mexicans and hobo labor, although on our Missouri division we are able to pick up native labor where we are able to transport the men back to

their homes each night by the use of motor cars. Previous to the war we also had a large number of foreigners on our sections, but these have largely disappeared and native labor has been substituted, with the exception that we still employ Mexicans at those locations where we have always had difficulty in furnishing any kind of labor.

The efficiency of our labor has increased because of the larger use of native labor, and also because the larger proportion of Mexicans in service are mostly men of experience. We therefore get better results now than we did previous to the war with the inexperienced labor that we were then obliged to pick up.

Our labor requirements have been very much reduced because of labor-saving devices. The American ditcher and the Jordan spreader ditcher have done away with the necessity of doing any hand ditching on our territory. Our instructions at the present time are not to mow the right-of-way, which has further reduced our labor requirements. Our track weeds are handled by discing machines and weed burners, and this machinery has reduced the expense of cutting track weeds possibly to one-third of the former cost. Our track mowers cut one swath of weeds on each side of the track at about one-fifth the cost of pre-war methods. Our rail-laying machines take the place of perhaps 16 men required with pre-war methods, and are also used for bridge work, handling heavy material, picking up rail, etc., when not actually laying rail. Our motor cars have enabled us to lengthen our branch line sections and put the men on the job in fresh condition in considerably less time than formerly.

Some Scarcity Anticipated in Michigan

By J. F. DEIMLING

Chief Engineer, Michigan Central, Detroit, Mich.

We found very little scarcity of labor in 1926. This year is expected to be about on a par with 1926 in the amount of work done; the first three quarters of 1926 probably comparing with the last three quarters of 1927 in increased activity over the last quarter of 1926 and the first quarter of 1927.

The probable effect of this volume of work will be a somewhat greater scarcity of labor in the months of our heaviest maintenance program. Large construction projects started early in the spring should fare best.

There has been little, if any, change in the character of labor, nationality, etc., during the last two or three years, but there has been a slight decrease in labor turnover.

The tendency to make use of machinery in place of manual labor is gradual, steady and most apparent in extensive construction projects where tractor and railroad shovels, graders, etc., are replacing 25 per cent or more of the men formerly employed in such undertakings.

Sufficient Labor Available for Work in the Northwest

By C. T. DIKE

Engineer of Maintenance, Chicago & North Western, Chicago

The labor supply was adequate to meet all of our maintenance requirements during 1926. Program work was started the latter part of March when labor was plentiful in the labor centers. There was also no difficulty in securing plenty of labor in outlying Chicago & North Western territory and I am of the opinion that

this was due in part at least to a reduction in the volume of work on the highways throughout the agricultural districts. Also a light grain crop in western Minnesota, the Dakotas and western Nebraska in 1926 contributed to this condition.

The amount of railway and other work now in prospect in the territory served by our lines will probably be about the same as last year with a slight increase in labor requirements for highway work in certain localities. We do not, however, anticipate any shortage of labor during 1927.

There has been some increase in the efficiency of labor during the last three or four years and it is our opinion that this increase was more marked during 1926 than previously. We believe this is due in no small part to more efficient supervision and the use of labor-saving devices. The more extensive use of labor-saving equipment has resulted in a marked reduction in unit costs and, generally speaking, has increased the efficiency of labor.

Expect Labor Shortage in Southwestern Oil Fields

By F. T. BECKETT

Engineer Maintenance of Way, Second District, Chicago, Rock Island & Pacific, El Reno, Okla.

The labor supply during the last year was generally satisfactory, although there were a few isolated places where we were short of labor temporarily.

The amount of railway and other work now in prospect is approximately the same as last year, although through the oil fields the conditions indicate more activity than last year. In these active territories the supply of labor will probably be inadequate.

There has been no change in the character of labor during the last two or three years, other than that more natives are engaged in manual labor than in the past, with less Europeans and other foreigners, except Mexicans, who are on the increase. The labor turnover is much less than previously and the labor is of better class.

Labor-saving equipment is improving the quality of labor and increasing the amount of labor done per man. We have also noted through our territory a marked improvement in work among trackmen since the eighteenth amendment has been as well enforced as it has.

A Busy Year Is in Prospect in the Southwest

By A. A. MILLER

Engineer Maintenance of Way, Missouri Pacific, St. Louis, Mo.

The labor situation with us has not materially changed in the last two or three years. We have had little trouble of any kind in obtaining the labor necessary for our maintenance of way work. As has always been the case in the south we had a little trouble in keeping our gangs filled during the cotton season, in some small restricted sections. This condition, however, did not prevail for more than five weeks.

The amount of railway and other work in sight for 1927 compares favorably with that of 1925 and 1926. On our lines, we will do as much and possibly more during 1927 than in the two previous years. I do not anticipate that there will be any shortage of labor to take care of the work undertaken during 1927.

With us, there has been no marked change in the

character of labor. I feel that the efficiency of our labor has risen from an average of 60 per cent to a present average of 70 per cent. Previously we did not obtain from labor, returns equal to more than 60 per cent of the money paid out for it. On our lines the efficiency of labor has been increasing during the last two or three years and it has come up from its previous average of 60 per cent to a present average of 70 per cent.

I have long been of the opinion that as compared to other industries and, in fact, as compared to other departments of the railroads themselves, the maintenance of way department has been backward in developing effective and efficient labor-saving devices. By this, I do not mean that those already perfected are not effective in saving labor, but I have in mind that we have been rather backward in the number of labor-saving devices.

On our lines, as I presume is also true on other lines, we are constantly taking advantage of devices and equipment put on the market as they prove themselves; and this year we have a somewhat heavier budget for work equipment than we have had for several previous years. In other words, we are going to buy more work equipment during 1927 than we have for a number of years.

Labor Is Plentiful and More Efficient on Pacific Coast

By W. H. KIRKBRIDE

Engineer Maintenance of Way and Structures, Southern Pacific Lines, San Francisco, Cal.

Labor was plentiful during the past year on the Pacific coast and in other territories served by the Southern Pacific, Pacific System. New railway construction on our lines will probably not be as heavy as last year, owing to the fact that several large projects have just been completed. There is every indication of a busy year in the building trades and manufacturing. Plentiful rains promise excellent crops.

We do not anticipate a shortage of labor to any extent, except a possible shortage of common labor during the fruit season.

No particular change has occurred in the character or types of labor employed in this territory. There has, however, been an increase in efficiency, due largely to the fact that our men, as a whole, are contented and do not change around as much as in the past. Labor-saving devices are employed as much as possible and the result is greater efficiency and a smaller turnover of labor.

Some Shortage Anticipated in South

By E. A. CRAFT

Engineer Maintenance of Way, Southern Pacific Lines, Houston, Texas

During 1926 the labor supply was ample, except during the period from August to December, during which time an extremely heavy cotton crop was being harvested in the territory served by our lines. We found it necessary in some instances to increase rates of pay temporarily to provide labor to carry on our more important projects. After December 1 the labor supply resumed normal proportions. We use principally Mexicans in Texas and negroes in Louisiana.

There is an unusually large amount of improvement and new construction work on railroads in prospect for

1927. Unless business conditions should cause some decrease in the amount of work to be undertaken it may be expected that there will be some shortage of labor during the harvesting season, but I do not anticipate that it will be as acute as last year.

There has been no noticeable increase in the efficiency of labor during the past few years nor any change in the character of labor as to nationality, etc. We are using labor-saving devices of various sorts to some degree and this, of course, has permitted us to carry on more work than would otherwise be possible during the periods of labor scarcity. We, of course, endeavor to get as much of this work done as possible during periods when labor supply is ample.

No Shortage in Western Canada

By FRANK LEE

Engineer Maintenance of Way, Canadian Pacific, Winnipeg, Man.

The labor supply during 1926 was entirely adequate and, in fact, greater than at any other time in the last five or six years. The amount of railway work in prospect for this year, in western Canada, is rather more than has been the case for the last two or three years, but we expect that the volume of work will not be so great but that the labor supply will be sufficient.

We have not noticed any particular change in the character of the labor the last two or three years and the efficiency, although practically unchanged for the last year or two is, of course, very much higher than was the case five or six years ago. Any labor-saving devices that we have been able to inaugurate, while actually saving labor on the work where applied, have not been of such widespread application as to affect our total labor demands materially.

More Work in Prospect in Colorado

By A. C. SHIELDS

Assistant General Manager, Denver & Rio Grande Western, Denver, Colo.

There was no shortage of labor on the Denver & Rio Grande Western last year. More railway work is now contemplated in this vicinity than was done last year, although from what I can learn no labor shortage is expected. We use mostly Mexican labor, the efficiency of which has been gradually decreasing. We are adopting labor-saving devices and equipment in every department in order to offset this deficiency.



The Pennsylvania Passenger Station at Johnstown, Pa.

How to Interest the Men in Power Equipment

The Methods Used by One Road in Developing the Maximum Service from Labor Saving Appliances

By G. A. PHILLIPS

Engineer Maintenance of Way, Lehigh Valley, Bethlehem, Pa.

THE use of power equipment in maintenance of way work is becoming general. Many articles have been published relating to the use of labor saving appliances on the Lehigh Valley, as this road has been a pioneer in the use of mechanical equipment in the maintenance of way department during the last 12 years. It is not my intention to describe in detail the operation of each appliance. It will be necessary, however, to enumerate some of the methods and to refer occasionally to some detail in relation to them.

The use of mechanical equipment in maintenance of way work originated largely on account of a shortage in labor and developed through the desire to perform work at the lowest cost. These two considerations, at first glance, would seem to be the most important results to be obtained, but on the Lehigh Valley we have discovered a third important purpose. It has aroused in our men, both supervisory and others, a spirit of competition that has extended over the whole railroad and has instilled in these men the necessity of always being alert to find an opportunity to make economical use of some mechanical tool, thereby simplifying their work and avoiding the excess expenditure of money.

Equipment Is an Aid to Men

The section motor car was one of the first power units installed and at the present time, every gang on this railroad requiring such equipment is so equipped. Non-productive time riding to and from work is reduced and the men are placed at the scene of their labor fresh and ready for work. This feature is reflected in the character of our men and organization.

With the shortage of labor and the advent of heavier sections of rail, necessity was the mother of invention and the idea of using locomotive cranes for unloading, laying and picking up rail was developed about 12 years ago. This, together with the use of power drills for bonding the rail, not only solved the problem of handling this difficult and laborious work but it also allowed us to lay our entire rail allotment for the year during the winter with the small force employed at that season, reflecting itself in the improved morale among section



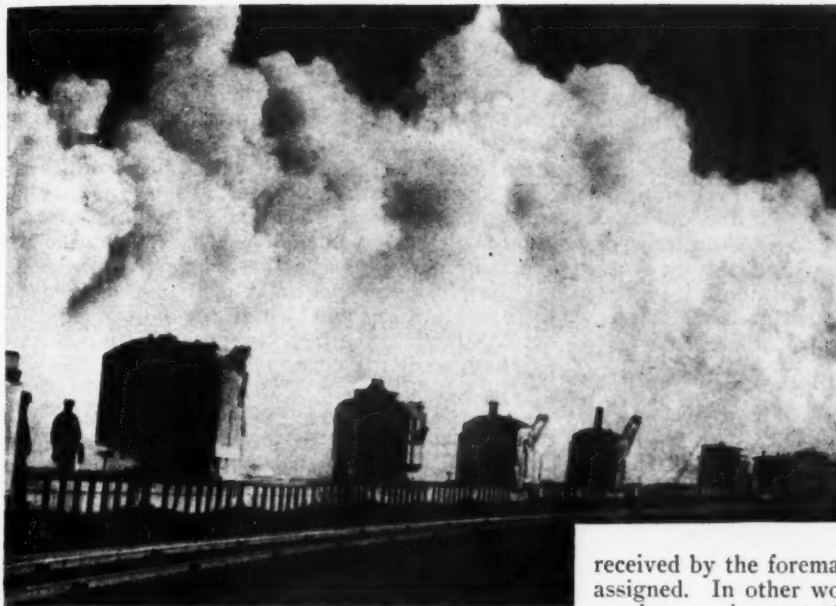
foremen by allowing them to apply themselves to work in the summer that can not be performed during the winter. In other words, a small winter force could not handle the rail program by hand, necessitating extending this work into the summer. Power machinery solved the problem and allowed the section gang to put in ties and surface track during the entire summer and when fall came, the foreman had a good section and was enthusiastic and full of courage.

Locomotive cranes are used on this railroad in many capacities and they have been an important factor in effecting economies and turning disagreeable work into one of pleasure for the men and foremen. The handling of creosoted materials such as incident to the renewing of bridge ties, is an excellent example of this. By this method we replaced all of the bridge ties on the Delaware River and Susquehanna River bridges, the former 1,103 ft. long and the latter 1,808 ft. in length, in one day. Formerly it was a season's work to renew these ties by hand under traffic.

Many other discouraging problems arise in maintenance of way work. By discouraging I mean an unlimited amount of work to be performed with a shortage of men and in many cases, with unskilled men. I am referring to such items of track maintenance as tamping track and cleaning stone ballast.

Work With Power Tampers Less Arduous

Tamping track by hand is hard and exhausting work, particularly during hot weather and, of course, non-uniform results are obtained. Power tamping solved this problem and introduced considerable relief which our men appreciated. This is reflected in the amount of work done and as the gangs under the various supervisors are acquainted with each other's monthly progress, friendly competition results. Power tamping is very desirable from a maintenance of way standpoint and it is particularly gratifying to



Locomotive Cranes Have Been an Important Factor in Effecting Economies and Turning Disagreeable Work into One of Pleasure for the Men and the Foremen

us that our men prefer and request these tools rather than making it necessary for us to force the issue and probably receive correspondingly poor results.

Cleaning stone ballast was very expensive work a few years ago. It was impossible to secure enough men to perform the work by hand and financially impracticable to attempt it in its entirety as occasion required. It was, however, essential in order to maintain the railroad properly and necessity again came to the rescue, the locomotive crane and screens placed on cars being the result. This method proved effective for it enabled us to accomplish the work at the time desired and instead of the section forces facing an insurmountable barrier and discouragement before starting their season's work, they now know that this problem has been solved by the use of mechanical equipment and it is possible for them to plan and execute a season's work according to a well-defined schedule established early in the season. The majority of our track is surfaced in cycles of four years, each division, sub-division and section working to the same schedule. Power machinery has been a great factor in allowing the work to be prosecuted in this systematic manner, rather than by a skip and jump method employed by men buried with work and discouraged.

I have mentioned a few specific cases of the application of power appliances influencing our men. The Lehigh Valley uses in the maintenance of way department all of the modern practical power tools manufactured and our men have also developed many devices themselves. I purposely refrain from going into further detail on the direct use of each appliance and the resulting economy, but desire to treat the matter more generally and show what an important function machinery is playing in the development of our organization.

Equipment Must Be Kept Busy

In order for a railroad to secure the maximum advantages from expenditures for labor-saving equipment it is, of course, necessary to reduce the idle time of these devices to a minimum. The idle time, in many cases, depends upon how the power tool is

received by the foreman and the gang to which it is assigned. In other words, the frame of mind of the employees using a tool is the key to the situation. If a tie tamper is sent to a foreman for the first time, accompanied by a letter from the supervisor with instructions to start surfacing track at a designated point, the chances are that failure will result and the machine be condemned by all concerned. This is where the supervisory officer plays an important part. He should be in constant personal touch with his men, instructing them and demonstrating the appliance to their full satisfaction. Having accomplished this, it is his duty to insist that the machinery be used the maximum amount. Nine times out of ten, success will then be his and he will have difficulty in furnishing sufficient tools to supply the demands of the various gangs.

Organization is, to my mind, the most important part of our program. Labor-saving devices make work more pleasant and are thus an important factor in bringing about a smooth running organization. Personal contact with the men, particularly the foremen, is also necessary and any indication that can be given the men that will cause them to feel that a road and its officers have their interests at heart will help. There is some work for supervisory officers in the office but about 99 per cent of their time should be spent out on the line.

Ingenuity Is Encouraged

The constant vigilance of our men, previously mentioned, has in many cases awakened their ingenuity, new ideas are continually being injected into the work and enthusiasm is ever present. This spirit is encouraged. A standard plan should carry with it enough flexibility to allow it to contract or expand to meet any condition, and our foremen know that they will not be criticised for "using their heads" which is an incentive for the development of ideas. We aim for simplicity and common sense, which would appear to be the logical way to reach the men and constitute one secret of economy. A man's success is dependent to a large extent upon his subordinates and he should supply them with everything necessary.

Co-operation plays an important part in reducing the idle time of power machinery purchased by railroads. In the process of rail laying the use of one

main track is desirable. When cleaning stone ballast, tamping track or performing many other tasks, the co-operation of the transportation department is necessary. Under our divisional system of organization, the superintendent is responsible for both maintenance and operation and is interested in minimum costs for both which are brought about in part by reducing the idle time of machines by surrendering one track for rail laying purposes and accepting an occasional slow order in order to carry out other classes of work economically. There is no transportation officer on this railroad who would not object strenuously to the old method of laying rail because the delays to trains on this account have been reduced to a minimum by the present method.

Co-ordination Promotes Uniformity

Human nature is a great and interesting study, playing an important part in the progress of all work. If the various supervisors work independent of each other for a year a road will, in all probability, secure non-uniform results. If an effort is made to co-ordinate and make uniform these respective subdivisions by writing letters, one will not be successful. To my mind the only way that uniform results over the entire railroad can be obtained is by personal contact with the men. To be absolutely assured that each supervisor has made proper use of the tools supplied him, it is also necessary for all concerned to be familiar with what the others are doing. If this is done a supervisor's pride, if nothing else, will have a tendency to prompt him to proper action. Supervisors on the Lehigh Valley make frequent trips over the road but the fall track inspection trip furnishes the best proof of the judgment exercised during the year by these men and other officers, including foremen.

The fall inspection takes place at the end of the working season. All superintendents, division engineers and track supervisors go on the trip. The rear car of the train is fitted with seats, presenting a clear view of the track to all. The division engineer, on his division, stands at one corner of the car, announcing matters of general interest and the track supervisor stands in the opposite corner, calling out each mile post and the section limits. The division engineers and supervisors form committees and mark each mile of track. Computations of these markings are made in the office of the engineer maintenance of way and published shortly after the completion of the trip. No cash prizes are offered, the purpose of the trip being to show what has been accomplished

during the year and the result is far-reaching in promoting uniformity over the entire railroad. Following this trip each division takes its track foremen on a similar trip over that division. These trips create a spirit of friendly rivalry which carries with it the tendency to arouse human ingenuity and each season discloses some new idea.

Our railroad, constructed with 136 lb. rail, heavy tie plates, rail anchors, creosoted ties, stone ballast and employing extensively labor-saving devices, is improving yearly while our expenses have been well kept within bounds as is best indicated by the fact that our cost per track mile, including all items for 1926, was \$2,677.14 and for track items only, \$1,559.85, notwithstanding the fact that our 1926 and 1927 rail renewals were taken care of in 1926.

Erie Announces Prize Awards

SUPPLEMENTING the reports of prize awards to employees of the maintenance of way departments on various railroads presented in the January issue as a result of the annual track inspections, we give below the list of prize winning supervisors on the Erie. In accordance with the custom on that road, the inspection was made with the assistance of an instrument car which records surface, gage and cross level. In addition to first and second prizes of \$200 and \$100, respectively awarded to the supervisors on each of the Erie's three regions whose subdivisions received the highest and next highest ratings, special prizes of \$100 were presented to every supervisor on whose subdivision the inspection car recorded no joints that were $\frac{3}{8}$ in. low or more. Thirteen prizes of \$150 were given to foremen whose sections received the highest rating on each division and 47 prizes of \$100 and 34 prizes of \$75 were presented to foremen for first and second ratings on individual subdivisions. The total awards are to both foremen and supervisors amounted to \$11,700. Winners of the supervisor's first and second prizes are tabulated below.

New York Region, Main Line

Division and Name	Amount
Delaware—H. J. Weccheider.....	\$200
Susquehanna—F. Fiske	100

New York Region, Branch Lines

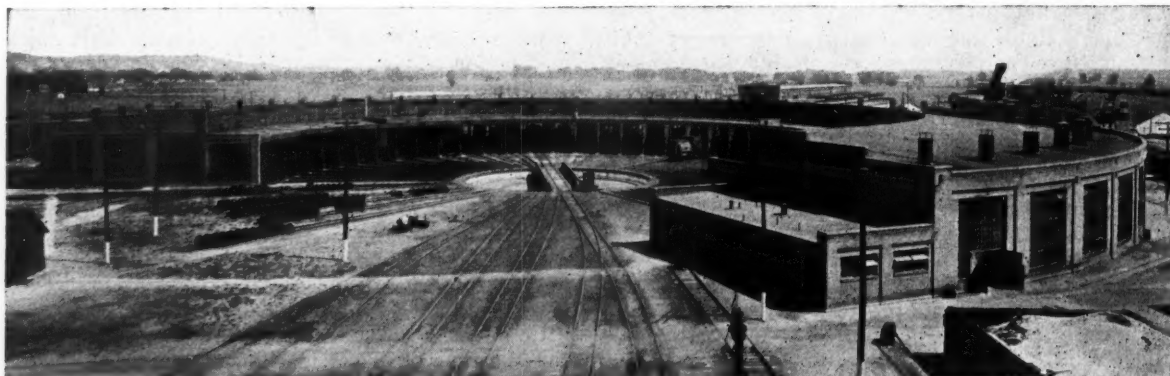
Tioga—J. J. Leonard.....	\$100
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Ohio Region, Main Line

Allegheny—W. H. Connolly.....	\$200
Mahoning—J. Lyman.....	100

Chicago Region, Main Line

Marion—A. Burgett.....	\$200
Kent—N. E. Scribner.....	100



The Roundhouse of the Union Pacific at Council Bluffs, Ia., Is Neatly Maintained.

If We Had No Labor Saving Equipment

An Attempt to Portray the Difficulty of Meeting Present Problems with Equipment of Last Generation

By JAMES SWEENEY

Supervisor of Track, Chicago & Eastern Illinois, Danville, Ill.



Tracks Like These Require Mechanical Aids.

THE railways are often compared with other and younger industries for the purpose of showing the railways' backwardness in their methods of doing things. Since the manufacture of the automobile has been developed to the point where a miscellaneous assortment of junk is fed into one end of the factory to emerge a glistening meteor of the road at the other, we are forced to admit that industry has taken full advantage of the mechanical opportunities of a mechanical age. We of the maintenance branch of the railways are not much concerned, however, with factory methods, for our work is not such that it can be taken to a shop. We do stop to take stock, however, when we see a farmer plowing in a field with a tractor, for there is an industry, like ours, where the shop must go to the work and not the work to the shop.

Just how far we will be able to progress with machinery is beyond even the wildest guess. It is even difficult for one to say how far we have already gone, for many of the devices we use now in the belief that they are the first awkward ideas anyone ever thought of applying to that particular operation are themselves actual labor saving devices in no small way.

An example of this is found in the ratchet track jack, without which we would be in a rather sad plight. To illustrate how the lowly track jack came into its own requires some knowledge of the history of the railroad.

The tramways' principal use was at the quarries and due to the heavy loads carried these tramways were brought to a comparatively high state of perfection. The track was well built and the cars were of sturdy construction. Being horse-drawn, there was no need for experiments in greater power of locomotion and the track remained the same as it had been from the first, with a few minor changes.

With the advent of the locomotive the tramway afforded an example of the highest known standard

of track construction and when the Baltimore & Ohio began building in 1828 the tramway track was accepted as a model. Now the rails of this type of track were of wood, on the tops of which $\frac{1}{2}$ -in. iron plates were fastened with screws.

Equipment gradually grew heavier and the combination wooden and iron rails gave way to the double ball iron rail, but iron rails were always light, even when made in the present standard section, and we may consider the track as having been practically a tramway track up to the advent of steel rails, which were produced experimentally in 1865.

When it was necessary to raise a rail in those days a bar was used as a lever; as the rail increased in weight this was found impractical and a long lever with a hook on one end was used. Four or five men pulled down on the lever and up came the rail. Go out and put a lever under a present day steel rail and figure the man hours saved by a ratchet track jack. In passing it might be mentioned that the ratchet jack came only after we had been using the screw jack for years and had found it too slow.

The fact of the matter is that the present steel rail has outgrown the unaided hand of the trackman and if he should be required to take the rail off the

cars, remove the old and put in the new rail with his bare hands he would be forced to give up. Of course, it was possible to do things with the lighter rail that we can not do with heavy rail, but the evolution of the present system of unloading, placing and picking up rail with steam power has been a slow process, always a step behind the increasing weight to be handled.

The Old and the New in Track Construction

In the great period of railroad expansion following the depression of 1873, railroad construction was pushed into new territory literally by hand, the only aid coming from horses. Rails were hauled out on one-horse rail cars and the ties were hauled out ahead of the rail car by teams. The Roberts rail laying machine was the first I had any experience with and it came years later.

Ballast, in the original scheme of railroad construction, was a thing much to be desired but not indispensable. Gravel was preferred over sand or cinders, while soil could be used, according to the best engineering authorities of the early sixties; in actual practice a lot of it was just plain grass.

The standard of the time was 12 in. of good clean gravel; to put that amount of gravel on the track was no mean task. Flat cars with side boards were used with a capacity of ten yards. The gravel was all loaded by hand; to load one car was about all one man could do in a day. As a rule, we worked four men to a car and when a train was loaded we either took the loaders with us or picked up other men to shovel the gravel off the cars. The best arrangement resulted where the gravel was to be used by an extra gang for otherwise there was the loss of the time of the men going to and returning from the point of unloading.

Grading Then and Now

Again the year 1865 figures as a turning point in railroad history for it was in that year that the steam shovel, invented in 1840 by Otis, came into general use. Its power and its limitations in connection with railroad work are perhaps best illustrated by the Irishman's comment when he first saw it at work: "Y' can do the work of a hundred men, but y' can't vote." There have been times aplenty when the railroads, hard pressed to exist in the face of opposition, could have used the hundred votes but the steam shovel has never been given the franchise. In its own field it has advanced from the one-yard bucket to the modern type, which handles five yards and more.

Even with the small dipper working steadily it was necessary to improve the method of unloading the ballast and some genius rigged up a wooden plow to be drawn along the train by a cable. It was a crude affair, following a wooden rail spiked to the center of the car and had to be helped from car to car. The motive power was furnished by the locomotive. This unloaded the gravel on both sides and between the cars; the next step was to provide steel aprons to close the gap between the cars. The matter of unloading on one side of the car only was settled by the invention of the side plow. The locomotive was found to be a trifle unruly for the task of pulling the plow and the Lidgerwood came into use.

Dump cars of all types are now used in ballast service, but there are so many other uses for that type

of equipment that other fields may be said to be equally responsible for their origin.

We have seen how the rail and then the ballast have been given over to the machine in a large measure, but the roadway, as well, comes in for no small amount of machine work. In construction work both cuts and fills were first made by hand or with teams. Where teams could not work to advantage the station man came with his wheelbarrow. Compared to the steam shovel and the tractor on similar work the team and the station men are but ants toiling with grains of sand.

There is not a great amount of construction work being carried on now, but there is always a certain amount of roadway work to be done, one of the principal items being ditching. That is one thing that seems never-ending and the day is not yet forgotten when we were still scratching around with plow and shovel, undoing the damage of the seasons. The ditching machine now takes care of all this work, where there is enough of it to justify the use of the machine, and then goes over to the coal pile or the cinder pit to do a chore for the operating department.

Two other problems of the roadway, fortunately, somewhat widely separated, are weeds and snow; and do not overlook the fact that they have both been native to this country for a much longer period than the 99 years given over to railroads. The weeds are well taken care of by the weed burner, which works with a much greater speed and a higher degree of efficiency than the best man who ever saved time by whetting his scythe.

The Development of the Pile Driver

Another branch of maintenance is the bridge and building work, to which have been applied many methods for doing things mechanically. Shops have been built to meet their needs and the handling of their heavy material is almost wholly performed by some mechanical means or other. In the building of bridges, derricks, concrete mixers and pile drivers are standard equipment. In the matter of driving piling there is quite a story. To those who do not know the humble beginning of the pile driver, it will be interesting to study the next modern pile driver seen at work. A cable is attached to a pile, perhaps so long that it was shipped on two cars, and it is hauled up to dangle in the leads. It is allowed to settle by its own weight on the exact spot where it is to be driven and the hammer is lowered onto it. If the soil is soft, the weight of the hammer may sink it many feet and then the steam is cut in. The rest is the most matter of fact operation imaginable, as all the steam hammer does is to sit there and drive piling.

How decidedly different was the first pile driver, mounted either on skids or on the end of a flat car with leads to be lowered or raised by hand. There was a single pulley mounted in the top of the leads with a rope or cable running through it, which could be used either to raise the piling to position or to raise the drop hammer. The other end was attached to a drum operated by a horse. The horse went round and round, the hammer crawled its slow way to the top and fell—ker-thump. A farmer in an adjoining field followed a team of horses hitched to a 12-in. breaking plow, and more for his own amusement than for the guidance of the horses, continually droned "gee! haw! gee!" Down the track could be heard the section gang, increased by the addition

of other gangs for the day, lining track. The best track liner of all the foremen assembled was displaying his keenness of eye and strength of voice.

This is all gone. A modern pile driver crew would not know how to start with such an outfit, the farmer has almost forgotten what gee and haw mean and the section foreman uses a track liner and his own gang to line his track. Fortunately, we have been able to save the foreman's part of the operation and he may still direct the men with the old sing song "jint ahead, cinter back."

This article is not intended to indicate what work is capable of being performed with labor saving machines, or what the saving is on any operation. There are more than two hundred and fifty thousand miles of railroads in this country. Most of it is

pretty good railroad and the oldest of it is not yet a hundred years old. The oldest started out on tramway tracks with tramcars for freight and stage coaches on platforms for passengers. In the century that has elapsed we have built almost as much mileage as all the rest of the world combined and, apparently, we have completed our building. Now is the time to stop and take stock of what we can do better in a mechanical way. We know we have gone far, for if we were deprived of our labor saving devices, we could not find more than a fraction of the man power that would be required to maintain our railroads under the traffic and to the standards that are required today; but it is often encouraging when climbing a long hill to stop occasionally and look back to see how far we have come.

Materials As a Factor in the Conservation of Labor

BY F. R. LAYNG

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The Locomotive of Today Places a Far Different Load on the Track Than That of a Half Century Ago.

IN 1925, the Class I railroads, operating 90 per cent of the total mileage of the United States, spent \$2,654,842,000 for labor and \$1,157,781,000 for materials, exclusive of fuel, 53 per cent of all expenditures going for labor and 23 per cent being spent for materials, exclusive of fuel. Table 1 gives these figures for a series of years, and shows the trend of increase in the amount of money spent for labor and

material. These figures emphasize the importance of the conservation of labor and show clearly the reasons for the interest all railroads are taking in every suggestion that will cut down the labor expense.

This interest is not confined to any single department and is general in all phases of railroad operation.

In order to show the relationship between certain accounts in the maintenance of way department, Table 2 has been prepared.

Table No. 1
Class 1 Railroads
(000,000 omitted)

	Total Expenses	Labor	Material (exclusive of fuel)
1916	2,556	1,366	551
1917	3,080	1,618	612
1918	4,242	2,431	822
1919	4,689	2,644	1,002
1920	6,161	3,424	1,367
1921	4,915	2,590	1,134
1922	4,798	2,468	1,150
1923	5,327	2,785	1,266
1924	4,947	2,625	1,133
1925	5,001	2,646	1,158

Total expenses, per cent increase over 1916, 95.7; labor, per cent increase over 1916, 93.7; material (exclusive of fuel), per cent increase over 1916, 110.2.

Table No. 2
Class 1 Railroads—1925

Per cent of certain accounts to total maintenance of way expense	
Ties	14.5
Rail (including other track material)	11.0
Ballast	2.0
Track laying and surfacing	24.6
	52.1

From this table it will be seen 52.1 per cent of the total maintenance of way expense is connected with maintaining track and it is in this operation that the largest amount of money is spent for labor, which expense is segregated in the account I. C. C. No. 220,

known as "Track Laying and Surfacing." It will be noted that in 1925, 24.6 per cent of all maintenance expense was charged to this account.

Table 3 has been prepared to show the ratio of the amount spent on these items to the total operating expense. This table again emphasizes the importance of the account "Track Laying and Surfacing," which is strictly a labor account.

Table No. 3
Class 1 Railroads

Per cent of certain accounts to total operating expense	1915	1923	1924	1925
Ties	3.074	2.375	2.785	2.600
Rail (including other track material)	1.862	1.536	1.912	2.023
Ballast	0.332	0.373	0.345	0.360
Track laying and surfacing.....	6.846	4.282	4.349	4.429
Total maintenance of way and structures	18.866	16.416	17.394	18.001

It is recognized that in the other departments of maintenance of way there is room for conservation of labor, but in view of the fact that such a large percentage of the expense is in connection with the maintenance of track, it is thought that more can be accomplished if that relating to track is given closer consideration.

Much progress has been made in the past few years in the conservation of labor by handling material with machines and labor saving devices. Much has also been accomplished by the use of better methods in performing the operations necessary to maintain track and structures and real progress is being made in substituting machine work for hand labor in some operations. No doubt much more will be accomplished along these lines. This may be called direct conservation.

There is another field that has not been emphasized recently; that is the conservation of labor as affected by the materials used. Progress in this field has been made along four main lines: (1) By proper care of the materials used, (2) by the substitution of materials that are better adapted to the purpose, (3) by the use of materials of improved quality, and (4) by the use of materials that are more nearly adequate as to strength to perform the service required.

Materials Can Aid in Conserving Labor

In general the first three methods conserve labor in that the materials last longer and thus require less frequent renewal. With the fourth method there is a saving due to longer life and also a direct saving because less labor is required in performing the necessary adjustments due to the effect of traffic and the action of the elements.

We may think of the railway track as being made up of four elements: Ties, rail (including other track material), ballast, and labor. These four factors may be varied within rather wide limits in order to maintain a given standard of line and surface. But it should be clearly understood that if one or all of the first three factors is allowed to drop below par, the fourth factor must be applied in greater quantity to make up the deficit.

From Table No. 2, it will be observed that 52.1 per cent of all maintenance of way expenditures or 9.41 per cent of the total operating expense is included in the four items making up the track structure and it may be noted that the sum of the first three items, those relating to material, consume 4.98 per cent and labor 4.43 per cent of the total operating expense.

The most expensive thing purchased by a railroad is labor, so that every step possible that can be taken to conserve labor should be put into practice. If the materials used are inadequate as to strength or inferior as to quality or condition, a greater expenditure of labor is required and it should be kept in mind that this additional labor is temporary in the result secured. For instance, if too few ties are used it is necessary to use a greater amount of labor to maintain line and surface and labor is not only used to restore the desired standard but its application must be repeated frequently, in view of the fact that the real difficulty is an inadequate tie support. The same is true as to rail that is too light for the service required or that has become worn through use. The ideal is to build a track structure that requires a minimum amount of labor to maintain a given standard and this can only be realized by providing proper materials in sufficient quantity and maintaining them in a condition approximating the service rendered by new material. In view of the above, it is true economy that the first three factors be held at or near par and as far as possible they should be made to perform as much of the work as possible so as to cut down the fourth element to a minimum.

Table No. 4 shows the average weight of rail on Class 1 railroads for several years:

Table No. 4

1921 Average weight per yard.....	82.89 lbs.
1922 Average weight per yard.....	83.50 lbs.
1923 Average weight per yard.....	84.32 lbs.
1924 Average weight per yard.....	85.05 lbs.

The average weight per yard in the Eastern district in 1924 was 94.42 lbs. per yard.

Experience with the heavier rail sections, 115 lbs. or over, which came into general use about 1916, has fully justified their adoption and a more general use of these heavier sections will reduce very materially the track laying and surfacing account. In other words, this would be an important step forward in the conservation of labor. It is the writer's opinion that no railroad carrying 1,000,000 ton miles per mile of road per annum can afford to use rail weighing less than 100 lbs. per yard in its main tracks, and when the traffic density reaches 3,000,000 ton miles per mile of road per annum, sections approximating 130 lbs. per yard are justified. Experience on a number of roads using 130 lb. rail leads to the conclusion that this rail not only justifies the additional cost by reason of its longer life but that the track laying and surfacing account is also reduced from 20 to 25 per cent.

The labor expense in connection with maintaining line and surface runs from \$800 to \$1,200 per equated mile per year and the average is probably \$1,000. If this account is reduced 20 per cent there will be a saving of labor of about \$200 per mile per annum. An increase of weight of 30 lbs. per yard may be secured at a cost for the increased weight of rail and fastenings of about \$3,500 per mile. The interest charge on this capital expenditure is but \$210 per annum, so that the additional weight, taking into account the saving due to increased life of the rail itself and the saving in the track laying and surfacing account, makes a very profitable investment. It is also recognized that the use of the heavier rail lengthens the life of ties and ballast, makes for fewer derailments, and less wear and tear on equipment, and for a saving in fuel, all of which add materially to the saving due to the use of the heavier rail.

Mechanical Equipment Speeds Ballast Cleaning on Pennsylvania

Railroad Employed Labor Saving Machines of Several Types on 500-Mile Program in Central Region Last Year



A Battery of Cranes and Vibrating Screens in Operation

THAT labor saving equipment has a distinct place in ballast cleaning work, while not seriously questioned today, is demonstrated strikingly by the widespread use of such equipment in the extensive ballast cleaning program carried out by the Central region of the Pennsylvania during 1926, and further, by the greater economy and speed with which this work was accomplished by the equipment, as compared with what could have been expected from fork cleaning.

This ballast cleaning work extended from Altoona, Pa., to Mansfield and Newark, Ohio, this territory including 443 miles of two, three and four-track railroad, ballasted with trap rock, limestone, and some gravel. Within this territory, 500 miles of tracks, or about 30 per cent of the total main track mileage, was cleaned thoroughly, and good drainage conditions were restored, the necessity for this extensive program being due primarily to the heavy coal traffic in this territory which unavoidably fouls the ballast rapidly, requiring that it be cleaned about every three or four years.

Unusual as was the size of this program, even more unusual was the outlay of mechanical equipment with which about 80 per cent of this work was accomplished. This equipment included cranes with stationary screens and with vibrating screens, inter-track ballast cleaning machines, a track sweeper, a track suction cleaner, a track skeletonizer, and a light caterpillar-tractor crane.

Cranes With Screens are Used Extensively

The use of locomotive cranes and of ditcher-cranes mounted on flat cars is not an entirely new practice in cleaning ballast on the Pennsylvania, this equipment, in connection with screens placed on gondola cars, having been used effectively by that road for several years. During this time study of the equip-

ment has resulted in certain conclusions with regard to the most efficient equipment for this work. Thus for example, it has been found that the crane best adapted to the work is a 17½-ton self-propelled locomotive unit with the rear end of the cab tapered, and with a limiting slewing device so that the crane can handle a bucket in the inter-track space on one side of the track without its rear end obstructing the track on the other side. It has also been found advisable to equip these cranes with oil burners so that they will not require the services of a fireman, and furthermore, that a 600-gal. water supply in the crane tank is desirable to eliminate the necessity of refilling the tank during the working day. The bucket best adapted for use in this work has been found to be of either ¾-yd. or ⅞-yd. capacity.

In the cleaning of ballast by the use of cranes and screens, which was the method most widely used on the Pennsylvania during 1926, the operations consist principally of the removal of the ballast from between the ties and placing it in the inter-track space, and then, picking it up with a clam shell bucket and dropping it onto screens over gondola cars, the cleaned ballast rolling back onto the road-bed and the dirt falling into the cars. In actually carrying out the work, a gang of about 25 men precedes the cranes to clean out the cribs or spaces between the ties, throwing the foul ballast into the inter-track space. When self-propelled locomotive cranes are used, they are worked in a battery of from four to six units and are moved to the site of the work as one unit in a work train. When at the section of track to be cleaned, they are cut off at intervals, each crane with its adjoining cars then operating as a separate unit over the portion of track assigned to it.

When derrick-type cranes, mounted on flat cars and not self-propelled, are used in this work, the

number of such cranes is usually limited to four, all of which are operated as one unit in a train, both while cleaning the ballast and when moving about. With either type of crane unit, the force required consists of an operator and four laborers; two laborers stationed in the gondola car to trim the dirt, and the other two stationed on the ground to level off the clean ballast as it is discharged from the screen.

The screens used with these outfits, which have usually been of the stationary type, are set on the gondola cars at an angle of about 55 deg. from the horizontal to insure that the ballast will roll off freely. With this angle of inclination, one important difficulty has been experienced, this being that it was impossible to dump the entire load of a bucket on to the screen at one time without a large portion of the foul ballast rolling back on to the roadbed. Where this type of screen has been used therefore, it has been necessary to open the bucket gradually, a requirement which greatly retards the speed with which the work can be carried out.

Vibrating Screens With Hoppers Speed Up Work

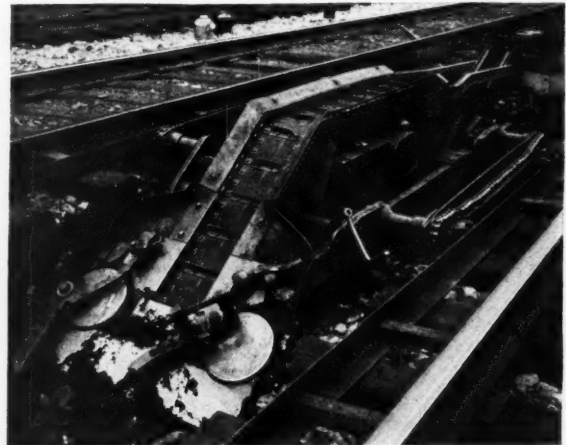
In order to overcome this difficulty and to expedite the feeding of the ballast to the screens, a special screening arrangement was developed. This consists of a screen placed over the car at an angle of about 40 deg. with the horizontal, and connected with a special vibrating mechanism which is operated by electric current supplied from a generator placed on the crane. Above the screen is a large metal hopper which makes it possible to discharge the entire load of a bucket at one time, permitting the bucket to return to the roadbed for more ballast while screening takes place automatically. Four such screening units were employed on the Pennsylvania during 1926.

With either type of crane or screen, the inter-track space was cleaned to a depth of from 14 in. to 16 in. below the bottom of the ties, the amount of work accomplished by each unit per day depending largely upon the length of time the equipment could have the use of the track. Where stationary screens were used, the amount of this work varied from about 400 to 750 lin. ft. of track per day, and the cost varied from \$0.16 to \$0.18 per lin. ft., including overhead, work-train and operating charges. With the newly developed vibrating screen and hopper arrangement, much better operation was effected, it being found that about 65 per cent more ballast could be handled with this equipment than was possible with the stationary gravity screens, and furthermore, that a better class of screening was accomplished.

Inter-Track Machine Precludes Delays to Traffic

While the method of cleaning ballast just described was used extensively on the Pennsylvania during 1926 and will undoubtedly be used in the future, one very evident and undesirable feature of this method is that it necessitates the occupying of a track with the attendant frequent delay to the work or to traffic. In order to overcome this difficulty a new type of machine was tried out on the Pennsylvania during 1926, this machine being popularly called a "Mole" or "Groundhog," and designed to operate between tracks by its own power, without interfering with passing traffic on either side. This device, described briefly in the November, 1926, issue

of *Railway Engineering and Maintenance*, consists of a steel frame from which is suspended the entire mechanism of the equipment including a gasoline motor power unit. In operation, this device moves in the inter-track space, traveling on longitudinal guides which rest on the ends of the ties on both sides. Digging arms at the front end of the machine rake the dirty ballast onto a belt conveyor which



The "Mole" or "Groundhog" Operates Entirely Clear of Trains

carries it over the top of the machine to an oscillating screen near the back where the refuse is screened out and the clean ballast allowed to fall back into the inter-track space. The refuse, falling from the screen, is deposited on a belt conveyor by which it is carried to boxes or pans placed at the rear of the machine.

Each of these machines operated on the Pennsylvania required a mechanic operator together with a



The Sweeper Cleans the Track at the Rate of About Four Miles Per Hour

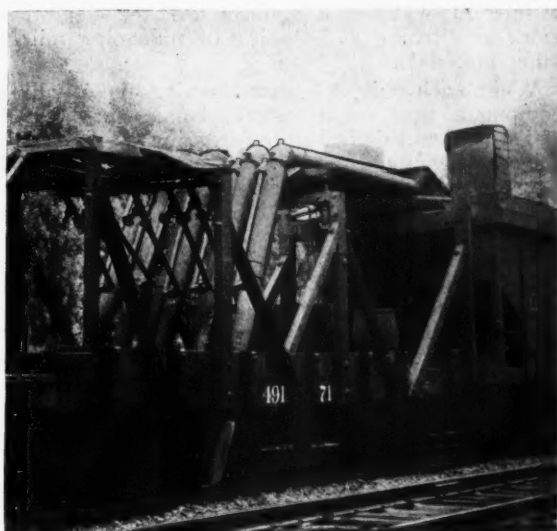
force of seven men to dispose of the dirt and to level off the clean ballast. The fuel consumption of each machine amounted to about 10 gal. of gasoline per eight-hour day. As operated, these machines successfully cleaned the ballast in the inter-track space, even at points where the ballast was especially compact and dirty, and the performance records established show that each machine is capable of cleaning about 600 lin. ft. of inter-track space to a depth of 10 in. below the bottom of the ties, in eight hours, at a cost of \$0.07 per lin. ft.

While both the cranes and the inter-track machines

just described have been used successfully on the Pennsylvania for the heavier ballast cleaning work, the frequent and heavy accumulation of surface dirt over the ballast on certain sections of the road led to the development of a track sweeper several years ago, whereby this fouling material could be removed from the track without disturbing the ballast beneath.

The sections of track where this condition has been most pronounced is on the mountain grades between Altoona and Johnstown, Pa., where ashes, cinders, engine sparks and coal dust from road and pusher engines and coal traffic accumulate quickly, and if not removed, foul the ballast, which in turn interferes with drainage and with the operation of signals. So severe is this condition that it is necessary that the surface deposit be cleaned from the track four to six times during the year.

The track sweeper used in this work is a power-



The Suction Ballast Cleaner

driven unit consisting essentially of a rotary steel broom, built up of steel splints, which is suspended beneath the frame of a flat car. This broom, which can be raised or lowered at will, is driven by a gasoline engine mounted on a car deck, and operates at about 100 revolutions per minute. When in operation, the broom sweeps the dirt on to a steel pan attached just ahead of it, through which it is guided to a wide conveyor belt on which it is carried to a hopper just above and ahead of the broom. From this hopper the dirt is discharged upon another conveyor belt mounted in an extension boom, by means of which it is carried to a gondola car coupled to the sweeper.

With this unit of equipment, the surface cleaning of the ballast was accomplished very satisfactorily, the dirt being loaded out at the rate of four or five cars per day. The speed at which the sweeper was operated on the Pennsylvania was about four miles per hour, and the total cost of the work amounted to about \$0.01 per lin. ft. of track cleaned. A more complete description of this machine was given in the October, 1922, issue of *Railway Engineering and Maintenance*.

Another device used to remove the dirt from the top of ballast, was a machine, developed on the Penn-

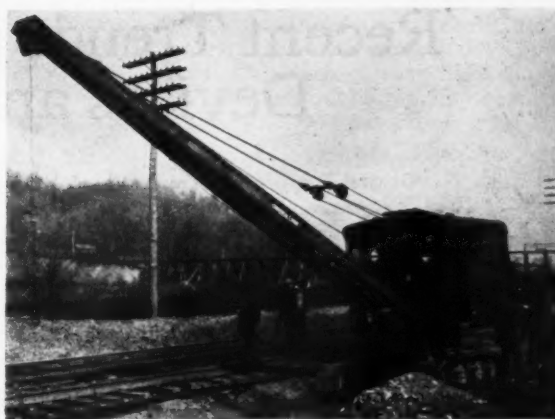
sylvania early in 1925, which is operated on the principal of a steam siphon, the steam being obtained from the work-train locomotive which pushes the unit over the track. This piece of equipment, which was described in *Railway Engineering and Maintenance* for September, 1925, consists essentially of a flat car on



The Skeletonizer Precluded Much Hard Hand Labor by Cleaning Out the Track Cribbs

which are mounted a series of seven 8-in. pipes spanning the width of a track and leading from the surface of the ties up and back over the end of the flat car into a covered hopper car which is coupled to the flat car. Steam blown into the upper ends of these pipes creates a suction in the lower ends of the pipes sufficient to draw up the dirt from the track and to discharge it into the adjacent hopper car.

This machine, which is commonly called the "Sucker" on the Pennsylvania, cleans the track at the



This Crane Proved of Value in Removing Inter-Track Ballast Too Dirty to Clean

rate of about four miles per hour, and at a cost of about the same as cleaning with the sweeper, \$0.01 per lin. ft. of track.

The Skeletonizer Cleans Out Cribbs

In order to reduce the amount of hand labor required to remove the dirty ballast from between the ties in the track cribbs, when cleaning the full ballast section of the track, a gasoline-operated machine, known as the track skeletonizer was used to considerable extent during 1926. This machine, which was also described in the September, 1925, issue of

Railway Engineering and Maintenance, is a self-propelled unit, which, by means of steel digging shoes suspended from the superstructure, pushes the ballast from between the ties, out to each side of the track where it can be picked up and cleaned, or if on the outside shoulder of the track, and too dirty to clean, can be leveled off with a spreader.

On the Central region of the Pennsylvania, this machine was used principally in hard gravel ballast where it cleared out the cribs effectively at the rate of about one a minute, the cost of the work amounting to about \$0.08 per crib as compared with the cost of about \$0.12 per crib when removing the ballast with forks or shovels. The total force required with this machine when operated by itself consisted of an operator, two flagmen, and two laborers to assist in moving it from crib to crib, and on and off the track when required to clear for trains.

Caterpillar-Type Crane Is Used in Re-Ballasting

Another machine used on the Central region of the Pennsylvania in connection with its ballast work, for removing ballast too dirty to clean, was a five-ton, gasoline-driven crane mounted on a caterpillar tractor. This crane was used on a stretch of double-track where the embankment was wide enough to permit it to travel along and operate clear of the tracks. On the particular track where this crane was used, the gravel ballast had become so compact and mud-cemented, that it was deemed more advisable to remove it than to clean it.

In accomplishing this work, the ballast between the ties was removed in advance of the crane, being thrown into either the inter-track space or on the outside shoulder. When this was completed, the ballast in the outside shoulder of the track, including

that material which had been removed from the track cribs and thrown to that side, was pushed over the embankment by a spreader. Following this the dirty ballast in the inter-track space was picked up by the crane with a clamshell bucket and thrown over the side of the embankment. When the track was completely skeletonized, it was given a light lift and then reballasted.

The entire force required with the crane for this work consisted of one operator and four laborers, and with this force, about 900 lin. ft. of inter-track space was cleaned per day, to a depth of about 12 in. below the bottom of the ties. The cost of this work, which extended over about 12 miles of track, amounted to about \$0.06 per lin. ft. Some of the special advantages of this crane in this work were that it did not require a work-train or obstruct the track, and, on the other hand, that it could be moved across the tracks and loaded on either a flat car or a gondola under its own power. A further advantage of this unit was that it could be used for such other work as ditching and loading or unloading rail or other materials.

While each unit of ballast cleaning and handling equipment used on the Pennsylvania during 1926 and described briefly in the foregoing no doubt has some disadvantages as well as advantages, it is felt that each has proved its value in the work to which it has been assigned, not only from the standpoint of economy, but also from that of speed and the quality of work accomplished. All of this equipment, it is contemplated, will be relied upon for the work to be carried out during 1927. We are indebted for the information contained in this article to those men of the Central region, under whom all of this equipment was operated during the past year.

Recent Trends in Labor Saving Devices and Their Use

BY J. B. MARTIN

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LABOR saving devices constitute an old subject of discussion. They have been considered in meetings and conventions and have been the topic of many articles until the subject might seem threadbare. However, it is ever new because of the continual development and improvement of devices and of new uses for old devices.

It has been said, perhaps truly, that less progress has been made in the use of labor-saving equipment in maintenance of way work than in any other branch of industry. However, these conditions have changed in the last ten years, for railroads, like other industries, have felt the effects of the scarcity of labor and increased costs and have had to turn to other ways of increasing production and decreasing cost.

The railroads are today handling a greater traffic and with greater despatch than ever before, and the maintenance of way department has been faced with the responsibility of providing more and better facilities for this increased operating efficiency. To meet the present trend of transportation there must be better roadbed, tracks and other facilities; to accomplish this old problems that have long been neglected must be solved, the explanation for the past neglect

in many instances being simply that there has been no way of keeping the cost within satisfactory bounds with the old methods and equipment.

That maintenance of way men are now meeting their problems more successfully is shown by the fact that some roads have shown an actual decrease in the number of man hours required for maintenance in spite of increased traffic and a higher standard of maintenance. This has been made possible in no small part by the development and adoption of mechanical devices to replace hand labor for there has been more advancement along this line in the last few years than in a generation before.

This development is, however, still in its infancy although with the momentum that has been gained we may look for still greater progress in the next few years. American inventive genius is daring and restless and with the broad field presented we may confidently expect large results.

To realize this the manufacturer must have the cooperation of the railroad man and the benefit of his experience and advice. It is not necessary for the purposes of this paper that there should be any extended discussion of the steps to be taken by a road

before investing in mechanical equipment and devices but it should be preceded by a thorough investigation of first cost, cost of maintenance, probable life, work it will accomplish, its adaptability to the conditions on the particular railroad, the length of its season, its auxiliary uses, etc.

It is of vital importance to determine how large a portion of the time the equipment can be profitably employed. It is easy to say that a certain machine will show a saving on a certain job but it is quite another question to determine if it can be employed on enough jobs during the years to justify the investment. One of the frequent criticisms of such equipment is the amount of time it is idle. Often this is not the fault of the machine but rather it is due to the lack of proper planning on the part of supervisory forces. If we are to get the full benefit of these devices more attention must be paid to the programming of the work for which these machines are adapted. This question is receiving more attention and the occasion for criticism is passing rapidly. While practically all such equipment is designed for some specific work, multiple uses can be found for practically every device and its usefulness increased with profit to the railroad.

Men Must Be Trained in Use of Equipment

It has sometimes happened that equipment, after purchase, has been practically shelved due to the fact that the men to whom it was assigned were not sufficiently instructed and trained in its use. It requires more than simply turning a machine over to a gang of men with instructions to use it for certain work. Is it surprising that after doing a task by hand and in the same way for years, a new device seems strange to them and that unless they have thorough instruction, training and encouragement they will soon want to go back to the old way? Observation has shown that maintenance men are like their brothers in other lines in that they will be enthusiastic and ready to adopt any device with merit if it will speed up their work, lessen its cost or reduce their labor if they are encouraged and properly trained in its use.

This is of the first importance and means more than simply instructing them in the operation of the device. It means constant instruction in its application to their work and in its multiple uses. This brings us to what perhaps is the crux of the whole question—the planning and programming of the work and the thorough training of men in the use of mechanical devices.

Working Methods Must Be Changed

The more extensive use of labor saving equipment in maintenance of way work will in time revolutionize our methods of organizing and prosecuting maintenance work. Experience has taught us that the best results are obtained with mechanical devices when they are handled by thoroughly trained organizations. It is probable that the more extended use of expensive machines will lead to the organizing and training of special gangs or organizations for doing continuous work with machines. This will attract a better class of employees.

It would be beyond the scope of this article to discuss all of the devices that are labor-saving in nature. Any material that gives longer life is essentially labor saving. Treated ties are outstanding in this class and with refinements in their handling and tie plates of improved design we can expect longer

life and greater economies. A well designed and properly made tool may prove a greater labor saver than the most expensive piece of equipment. Progress is being made in the direction of better efficiency and longer life by the manufacturers and the railroads alike.

Specific Illustrations of Economy Now Possible

In the line of equipment, the more important devices that has come into use during recent years and is being developed for maintenance use is the locomotive crane. It has proved one of the most effective and money-saving machines that has been introduced into maintenance work. It can be secured in steam or gas power and can be equipped with a magnet and a drag line bucket. It is especially effective for cleaning up, handling material, scrap, fuel and snow, ditching, grading, changing crossing frogs and laying rail. In making extensive rail and ladder renewals in large yards it permits the distribution and picking up of material in close connection with its application and release. This expedites the work and is valuable from a safety standpoint. Being self-propelled a locomotive crane can work on interior tracks without work train attendance. Its range of usefulness is so varied that it can be assigned to a certain district and kept busy the year round.

The old and reliable ditcher is still on the job and can now be had in steam or gas power, the latter feature solving the fuel and water problems in certain localities. This machine is so well known and is adapted to so many uses that it is needless to speak of them. The application of a twisted dipper stick in recent years has made it a valuable machine for excavating between tracks.

Air dump cars in the 30-yd. size are coming into general use for maintenance and are very reliable equipment. They can be kept in continuous use on grading, cinder handling, bank widening, rip rapping, etc. They deposit material well away from the ballast and their capacity and rapid dumping operation makes them economical in comparison with hand operations or unloaders and plows.

Spreaders and Ditchers Are Versatile

There has been considerable development and improvement in spreaders and ditchers in recent years. The development of the ditching wings has brought about their use for ditching and widening many cuts where they provide a suitable berm, and a ditch of standard cross section and slope and deposit the material removed on the embankments, doing the work for about one third the cost by other methods. They also have a variety of auxiliary uses for they may be used for spreading ballast and they make very effective snow removers in yards, clearing several tracks by moving the snow into windrows where it can be loaded. They may also be equipped with ice picks for removing ice in yards.

During the past few years we have seen the general adoption of the crawler type of shovels and excavators by contractors and now the use of gas or Diesel engines on these machines is undergoing a rapid development. They can be used with a shovel dipper, drag line or clam shell. While only a few have yet been tried out on the railroads it would seem that there is a considerable field for their use here. Their mobility and freedom from fuel and water problems should make them desirable for certain grading, ditching, cut widening, stripping

and gravel pit operations. They save several men on the crew and considerable work train attendance as compared to the old type steam shovel.

Every road that uses stone or other varieties of hard ballast is, sooner or later, confronted with the problem of cleaning it. Hand methods are slow and expensive and altogether unsatisfactory. Locomotive cranes and ditchers can be used for this work but have proved rather expensive. Small machines equipped with screens and gas engines have been developed which are satisfactory to the extent of their capacity. Machines of the vacuum type are being developed and there has recently been put into use a machine of the mole type which picks up the ballast from between tracks, screens it, and returns the clean ballast, depositing the refuse in boxes. Other types which clean ballast on a large scale are being experimented with so that we may expect to see important developments in ballast cleaning machinery in the near future.

Weed Destruction Is Receiving Attention

Track mowers are now developed and improved to the point where they are efficient for mowing strips along the sod line, doing it at a cost of from one-half to one-third that of hand labor.

Weeding machines equipped with rakes which fold alongside of the car and are operated by air from the locomotive are very effective for removing weeds in hard ballast. Weeds are removed, roots and all, the ballast is loosened and renovated to a certain extent and the drainage improved. These machines are operated by work train and one machine will keep considerable territory in good shape at a very reasonable cost.

Chemicals and oil burners are now used quite extensively for killing weeds in the ballast. These methods are effective and economical. The current development along this line is the motor-propelled outfit for both oil burning and chemicals. While not of as large capacity as the work train-operated outfits they eliminate a considerable portion of the work train expense.

Tamping machines, air and electric, have been in use for some time but they have been greatly improved in recent years and are now a practical and economical method of tamping track. These machines may be had in various sizes with two, four, eight and twelve tools. This gives a wide range to suit various conditions; when desirable extra gangs may be outfitted with the larger units and cover considerable territory. The tamping machine is economical and fills a need where there is considerable labor turnover and the quality of hand labor is not good. They have other uses and can be used wherever it is desirable to operate either air or electric tools.

Cranes operated by either air, steam or gas are today essential for the handling of rail from the standpoint of both economy and safety. The cost of these machines is reasonable enough to warrant equipping each division with one.

Rail-laying machines of various sizes and capacities have been developed. They range from the three-man power-operated machine to gas-powered self-propelled cranes that can be equipped with a bucket or magnet and made available for a wide range of work.

Ballasting machines are now in successful operation for tamping track in high lift or ballasting operations. They are self-propelled and have sufficient

speed and capacity to turn out a large amount of work. They do good work and where used have shown a good saving over hand operation.

There is now being developed a self-propelled machine for removing the old ballast from the cribs ahead of the new ballast.

Ballast Distributing Equipment Is Improved

The old type ballast car is familiar to all and this has been further developed into a car of the selective type so arranged with pockets that the distribution can be governed and the ballast placed where wanted. This will produce a marked reduction in the cost of trimming and will prevent waste of ballast.

The old type of ballast spreader can be remodeled so as to remove practically all of the ballast between the ends of ties, reducing the cost of handling ballast for back filling and trimming as much as 50 per cent.

Roads which encounter serious corrosion from brine from refrigerator cars have found it economical to oil the rail and fastenings in the tracks. This is usually done with a work train equipped with oil tanks and a spray car and is effective and economical. For small operations and the oiling of joints and interlocking apparatus there has now been developed a smaller unit propelled and operated by a gasoline motor, which reduces the work train expense.

Motor cars are not new and have long since proved their worth. In recent years the tendency has been to improve and refine the free running engine type and this has led to the development of cars with sufficient power to handle several trailers. Entire extra gangs are now handled with one motor car and trailers with a sufficient saving of time to afford decided economy. They are also used for transporting material.

Switch point protectors have proved their work at severe points, doubling and tripling the life of switch points and helping to preserve the gage, saving labor to that extent.

Power Snow Brooms Are Appearing

Tractors equipped with revolving brooms are now used for cleaning snow from large station platforms, runways, loading platforms, etc., one machine doing the work of a large gang of men. It is true that they can be employed in handling snow only a small part of the time but at some points they can also be profitably employed in handling material at the store yards. It is possible that it may prove economical to do right of way mowing with tractors where the right of way is level enough to permit it.

Track liners have now been perfected so they are practical and useful tools for section gangs. Four men with two liners will line the ordinary stone ballasted track and will effect a substantial saving over the use of lining bars.

The power bonding drill is in general use and has speeded up the work of bonding, effecting a substantial saving in labor. The same idea is being applied to track drills and it is possible that this will prove economical in large yards where there is a considerable amount of drilling to be done.

BELT LINE AT MOBILE.—The Louisville & Nashville has been authorized to acquire trackage rights at Mobile which will permit it to operate a belt line around the business section.

Looking Into The Future

A Detailed Analysis of the Unsatisfied Needs for Equipment That Will Save Labor in Track Maintenance

By H. R. CLARKE

General Inspector Permanent
Way, Chicago, Burlington &
Quincy, Chicago



A Machine for Renewing Ties Comes at the Head of the List

THERE HAS been a great change in the methods of handling and performing maintenance work, and especially track work, in the last 25 years. A growing scarcity of labor and a steadily increasing wage rate have brought about this change, in fact, they have made it mandatory.

It is generally agreed that the scarcity of labor will continue and likely increase, due to the restriction of immigration and the increased demand for man power in industrial plants. The trend of wages is upward and it is not likely that there will be a reversal in this tendency. Will the development and use of labor saving equipment keep pace with the conditions that make the use of such devices necessary? The answer is: It *has* in the past and it *must* in the future.

It has been said that "a strong back and a weak mind" were the only essentials in maintenance work. Those of us who have devoted years to that work do not agree with this statement. We know the need of a strong back and a stout heart, but we also know that intelligence is a requisite. This need is now generally acknowledged and maintenance work is gradually being recognized as requiring skill and thought.

Men still active in the maintenance department remember the time when the standard ditching outfit was a string of flat cars and 50 laborers with No. 2 shovels. The roadmaster who had a plow, dragged over the cars by a cable attached to the locomotive, with which to unload his train, was well equipped. Ballast was handled in much the same way. The younger men find it almost impossible to believe that such methods ever existed.

The Use of Labor-Saving Equipment Can Be Promoted in Two Ways

If comparable advancement is to be made in the future, and if the use of labor saving equipment is to keep pace with the conditions making its use necessary, it must be in two ways:

- (1) By the development of equipment to perform tasks successfully that are now done manually.
- (2) By the more extensive and intensive use of equipment now available.

It seems difficult to suggest any entirely new ideas applicable to the first possibility. There are, however, a number of devices, designed as labor savers,

that have not been successful, or at least they have not yet been generally accepted and used.

At the head of a list of such devices should be placed a machine for renewing ties. This is a task common to all roads, large and small, and the labor expended in the renewal of ties is one of the largest in the distribution of maintenance expenses. Machines have been placed on the market which were designed to save labor in tie renewals, but the expected reduction in expense was not effected. To be efficient and generally accepted, a machine for the tie renewals must do the work more economically or better, and preferably both, than it can be done by other means.

The mention of tie renewals suggests a machine for pulling and driving spikes, not necessarily one machine for both purposes, but probably two machines. A spike driver is on the market, although not in common use. So far as we know a spike puller has not been attempted, but there would seem to be use for a practicable machine for this purpose. The spike puller and driver would both be used in connection with rail relaying. The spike driver might most often be used on new track construction, but if these devices were sufficiently light and portable, not too expensive and could demonstrate savings in labor and money, there is no reason why there should not also be a demand for them in tie renewals.

An Adzing Machine is Needed

The reference to rail relaying suggests an adzing machine. The proper adzing of ties on a rail relay job is of great importance and is a large factor in the life secured from the rail. A good job of adzing is difficult to get, partly due to the conditions under which the work must be done, furthermore the adzing gang on any rail relay job is a large part of the total force. The construction of a machine that will do a satisfactory job of adzing economically and stand up under the very severe conditions under which the work must be done, is not an easy task and may be impossible, but certainly there is a place for such a piece of equipment.

Some roads spend large sums of money in cleaning ballast and many other roads would do so if they could afford it. Screening and conveying devices to assist in this work are in use and a machine for

digging out the crib between ties is available, but not widely used. Undoubtedly there is room for the simplification of such equipment and at the same time to make it more efficient and economical. Ballast usually becomes dirty and foul on account of foreign material such as cinders from locomotives, coal screenings from cars, sand and soil from the right of way and adjoining fields getting into and mixing with the ballast. If this could be prevented or even reduced, less cleaning would be necessary and a longer period of service would be secured from ballast.

A dust-proof covering is hardly practicable, but a sweeping or suction machine, or probably a combination of the two should be possible. Large sums have been spent in efforts to develop such a machine, so far without satisfactory results. There is no question but that there would be a demand for such an outfit if it would do the work efficiently and economically. This demand would be increased by reason of the fact that it would be possible to use such a machine to remove dust from the track and so contribute to the pleasure and comfort of railroad travel by the elimination of the unpleasant dirt so often encountered under present conditions of maintenance with even the best and most expensive ballast. Some roads go to considerable expense in the use of oil, sprinkling the roadbed in an effort to prevent dust. However, there are objections to the use of oil and if successful, a cleaning machine would be preferable.

Further Development of Tie Tampers Needed

A further development in tie tamping equipment should be possible. The pneumatic and electrical tampers now in use are satisfactory on comparatively light raises, but a machine is needed which

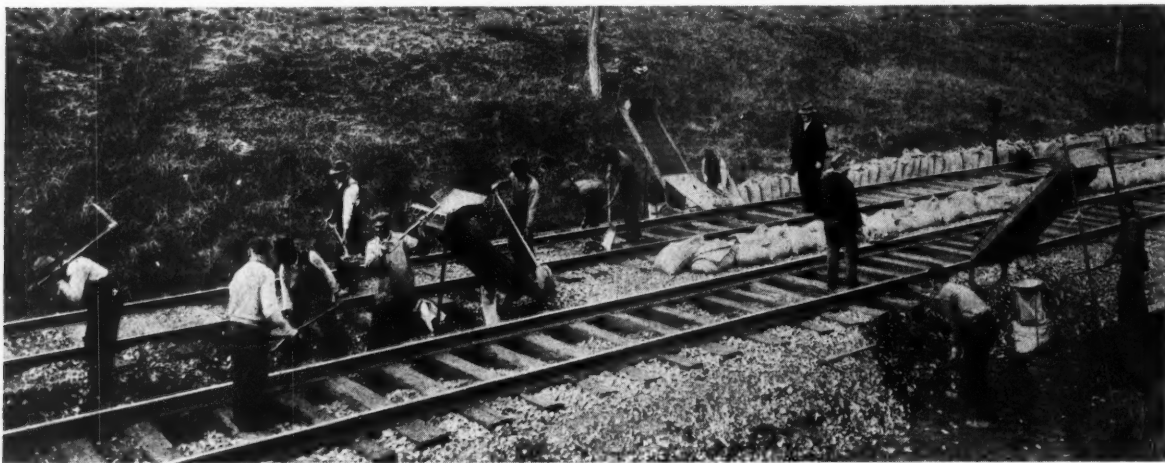
the necessary ties to hold the raise it would eliminate three to five additional men.

We now have bank shapers and ballast dressers, usually a development of the spreader. Such equipment makes a uniform section by plowing off and spreading the excess material. It is not readily adjustable to fit different sections or conditions and accomplishes nothing where there is a lack of ballast or a weak spot in the bank. It is expensive, often prohibitively so, to plow off and waste excess ballast. A machine that would gather up, hold, and transfer surplus material to points where the section is weak and so build a uniform roadbed would be in demand.

Right of way is still often mowed by hand, or, at best a farm mower and team are used. The development of light and speedy tractors that can travel on almost any surface should make possible an improvement and an advancement in methods of cleaning the right of way by the adaptation of mowing attachments for these tractors. Such a mower must be strong and rugged, since mowing the average right of way cannot be compared to clipping a lawn or golf course.

Ditching Offers Opportunities

As already mentioned, the advance in ditching practice has been remarkable. It is now generally expected that a ditching outfit will accomplish two things: (1) ditch the cuts and (2) widen and raise the adjoining fills. The distance that material can be hauled economically with the present usual ditching unit is limited. If a machine could be designed that would operate clear of traffic in a cut, digging a ditch of limited size so that the amount of material moved would not be excessive and load the excavated material in cars on the track alongside,



The Perfection of Machinery for Cleaning Ballast Would Save Much Labor

will be economical on raises of four inches or more. The pneumatic and electric tampers will no doubt be developed and improved. There is also a machine designed for tamping where track is lifted several inches, but the use of this machine is not common as its economy has not been proven. There is need for a successful machine of this kind.

Before track can be tamped it must be raised and it would seem possible to build a machine that would replace the three to five jackmen now used in raising track. If the same machine could also properly tamp

possibly more material could be moved at less cost and certainly by handling more yards per train a longer economical haul would result.

Such a machine would likely have to be of the caterpillar crawler type, readily adjustable to varying and uneven conditions and must be able to load sufficient material daily to justify work train expense. Builders of equipment of this kind tell us that such a machine is not practicable and this may be true, but there is a field for it.

Any labor saving device, to justify its expense

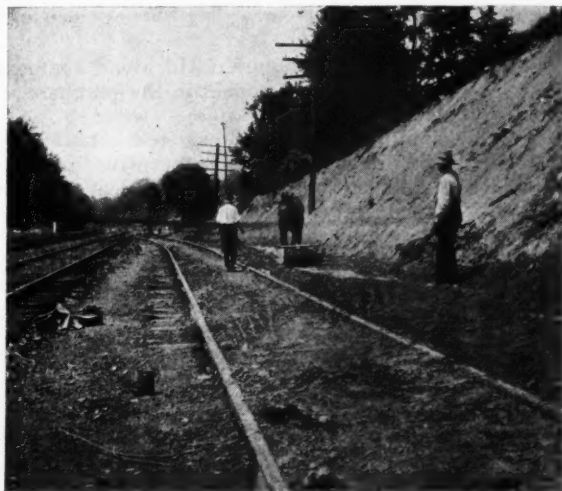
and be generally used, must do one of four things:

- (1) Perform a given task more economically than it can be done by manual labor.
- (2) Do a job better than it can be done by manual labor.
- (3) Do work which can not be done at all by manual labor.
- (4) Do work for the accomplishment of which it is not possible to secure manual labor.

Any machine fulfilling any one of these requirements will likely be used and if it can fulfil two or more, its wide use is almost certain.

As already stated, machines are now available in a more or less perfect stage of development which are designed to perform many of the tasks mentioned above, but the use of such equipment is still limited for the reason that it has not yet fulfilled one or more of the economic conditions necessary to its success sufficiently to bring about its extensive use.

In the past and in fact at present, in order to justify the purchase of labor-saving equipment, it has been necessary to demonstrate beyond doubt that by the use of this equipment we can and will



An Evidence of the Advance in Ditching Practice—An Approved Method of the Last Decade

accomplish at least one of the first three economic requirements outlined.

The time may come and conditions may arise which will make the fourth consideration (The ability to work for the accomplishment of which it is not possible to secure manual labor) a strong enough argument alone to justify the investment required. Many engineers and equipment supply houses think that this will be the case and that the increasing scarcity of labor may bring it about. However, we are not yet facing this condition, at least not to any great extent.

Increases in wages are making it possible to fulfil the first requirement (To do a given task more economically than it can be done by manual labor) more easily and often and the increasing lack of skill, efficiency and interest on the part of the labor generally available in maintenance work is effecting the same result with reference to the second requirement (To do a job better than it can be done by manual labor).

All of these factors influence the use of labor saving devices. The use of such equipment will be more

easily and frequently justified if it is possible to use it more extensively and intensively. Often this can be done.

Most equipment is designed for some definite task and is especially adapted to that job. Frequently it can also be used for other purposes. This is very important on a small road where equipment is limited and it should not be overlooked on large roads, well supplied with equipment. As a rule the larger roads buy machines for certain definite work and have enough of such work to justify the expenditure and to keep the equipment busy most of the time. There are, however, slack or off seasons. By the varied use made of equipment, when not required on its special assignment, worth-while savings are possible. The men in the maintenance organization can show their ingenuity and the dealer his interest by adapting equipment to work it was not originally designed to do.

It is possible to use a ditcher in loading and unloading rail, loading storage coal, etc. A rail laying machine can be used as a rail loader and by the bridge department in handling heavy timbers, such as caps and stringers, or light steel work. With a proper attachment, it can be used as a small clam shell cleaning up yards, doing light excavating, etc. A weed burner can be used to melt snow and ice on leads and switches during the winter. A spreader may be used to clear tracks of snow and ice. The compressor or electrical power plant of a tie tamping outfit may be used to operate rock drills, paving breakers, wrenches, saws, drills, riveters, etc.

The performance of equipment in these secondary and off-season uses must be watched carefully and analyzed to make certain that it is really justified by the economy effected. Having the equipment available, anyway, the matter of return on investment is not important if the machine would otherwise be idle.

Some Roads Are Not Using Equipment Available

It is not felt that much can be said in this article in regard to the failure of some roads, progressive in many ways, to make use of labor saving equipment definitely proved to be economical on many other roads. The economic principles already mentioned, governing and justifying the use of labor saving devices, must contribute to and will eventually force these backward roads to the use of economical labor saving equipment. Some roads still lay rail with tongs, while others will not tolerate such a wasteful practice. Maintenance department motor cars are relatively new and scarce on some roads, while others have been fully equipped for years.

On some lines the bridge department is forced to handle excavation work, even the wettest kind, by hand, while in other cases locomotive cranes, clam shells, etc., are available and used for this work and also for handling and placing heavy timbers, steel, pipe, etc. Portable power saws, drills, etc., are unknown to some bridge and building departments, while others take full advantage of such equipment and do better and more economical work by using them.

Such instances could be cited almost indefinitely by anyone at all familiar with conditions and practices on the different roads. The correction of such uneconomic conditions depends on the progressiveness of the management, the aggressiveness of the maintenance department and the ability of the maintenance officers to prove their case.

Getting the Maximum Return From Labor Saving Equipment

**Making the Machines Pay Bigger
Dividends by Keeping Them
in More Constant Use**

By LEM ADAMS

**Roadway Assistant, President's Staff, Union Pacific,
Omaha, Neb.**

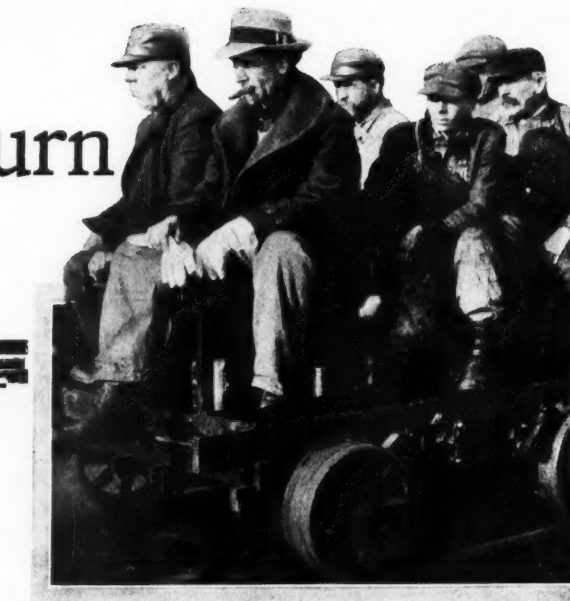
IT IS evident that the supply of common labor for railway work will continue to decrease, resulting in steadily increasing costs. With this situation confronting the railroads, the only alternative is to provide means for doing a large part of the work with machines adapted to these tasks.

In order that these conditions may be met, machines are constantly being designed to take care of various needs, particularly in maintenance of way work. Some of the more important units of equipment in this service are the ditcher, air dump car, spreader plow, ballast shaper, locomotive crane, rail layer, paint spraying machine, ballast tamper, drag line excavator, weed burner, weed killer sprayers, track mower, and motor cars.

Requires Careful Program

It is obvious that the maximum return will be obtained by keeping as much as practicable of our labor saving equipment economically employed at all times; but how to do this is the problem constantly confronting the railroads as the use of some of its machinery is largely seasonal, particularly in the northern climates where the ground is frozen during the winter months. Therefore, it is necessary that a careful program be mapped out for their use. Further, successful and economical operation of machines is in a large measure dependent upon their being handled and repaired by skilled mechanics, carefully trained for this service, and upon their being inspected regularly to insure against unnecessary abuse.

The ditcher comes within the class of seasonal machines, but it makes an excellent crane for unloading rail or picking up released track material, owing to its lightness and speed of operation. Since winter rail renewal is steadily gaining in favor on many railroads, an opportunity is provided to keep the ditchers constantly employed. Of course, during the late spring, summer and early fall months, they will normally be assigned to their regular duty of cleaning cuts. Proper side ditch drainage is essential for well maintained track and the actual saving in roadway maintenance by the provision of clean ditches



and adequate roadbed shoulder will alone compensate for the expenditure incurred in the purchase of this equipment.

The air dump car is now considered a necessary adjunct to the ditcher, as one can be placed at each end of the ditcher and the material cleaned from the cuts loaded therein and hauled to convenient nearby fills, where it can always be used advantageously for widening embankments, thus making a more stable roadbed and providing a proper shoulder for ballast. We thus perform two economical operations in one. The modern air dump car of from 20 to 30 yd. capacity will dump material clear of ballast. It is also very useful during the winter months in the removal of snow from station grounds and around the portals of snow sheds and tunnels.

The spreader also is necessary equipment for dirt handling and is used for leveling up the material that has been dumped, in order to form a neat embankment. Of course, there are many other uses for the spreader in construction work where material is dumped alongside an existing track and spread out to form embankments for new tracks, etc. This machine is very effective in clearing snow in the winter and when so employed it can be used virtually the year round and pays for itself many times over in the saving of labor.

The Locomotive Crane

The locomotive crane has such a wide range of usefulness that it is an easy matter to keep it constantly employed throughout the year. It is a necessary machine for handling material in material yards and when equipped with a magnet is very useful for picking up small material along the right-of-way in connection with rail renewals. It is, of course, valuable for loading scrap or other materials handled by the stores department. A number of these machines are required on most railroads for unloading storage coal in the summer and picking it up in the winter; they are often employed for coaling locomotives direct from the car in case of coal chute failure. They are also used for unloading new rail and picking up released rail and on many railroads are used as



Many Opportunities For Profitable Use of the Motor Car. At the Right—The Motor Car Hauling a Special Concrete Car



rail-laying machines. Therefore, with its diversified uses, the locomotive crane is the premier of labor saving equipment in the maintenance department.

While ditchers or locomotive cranes are essential in the distribution of rail in connection with rail renewals, the rail layer has of late years come into prominence for actually placing the new rail in track and shows a great saving over the manual handling of rail with tongs. Only a few men are needed for the handling of this machine, whereas at least 20 men are needed when the rail is handled with tongs. The most popular machine for this class of work in use today is a light, manually-operated crane that is so light that it can be readily set off the track to allow for the passage of trains. A machine of this type permits of greater ease in the laying of the rail, greatly lessens the hazard of accident to the men, and permits increasing the output in lineal feet per man per hour approximately 50 per cent. These machines are not expensive and quickly pay for themselves in labor saved. Although a large quantity of main line rail is relaid in the winter, there is a considerable quantity of rail laid during the summer months, even on main line tracks; therefore, these machines can ordinarily be employed economically the greater portion of the year.

Another inexpensive machine that quickly saves sufficient money to absorb its cost is the paint spraying unit. It can be used for painting bridges and the outside of large buildings in the summer months and for the inside of shop buildings in the winter. While it is known that some ten per cent more paint is ordinarily consumed on a job, much better work is accomplished on bridges, as places are covered that cannot be reached with a brush. To offset this small

increase in material, approximately 40 per cent saving is made in labor.

The continuous employment of the ballast tamping machines present a difficult problem on roads having all of their lines in territory subjected to long periods of frozen track, as winter ballast work is impractical. However, roads having southern lines, or those that are located entirely in warmer climates, should program their work for the year round employment of their tampers, as their use is too valuable to permit them to be unemployed; therefore, they should be rotated in service, thus reducing the number required for general use. It is certainly not necessary to be tamping ballast in resurfacing or reballasting on all portions of the line at the same time. It is estimated that machine tamp-

ing saves approximately 35 per cent in cost over hand tamping and a much better job is obtained.

The ballast screening or cleaning machine is used for the removal of dirt and other foreign matter from rock ballast, as it has been found more economical to clean old ballast and re-apply it than to purchase new material at a cost of about \$1 per cubic yard. The same principle applies to rotating these machines in service as for ballast tampers.

A machine that has lately come into popular use on the railroads is the drag line excavator. It is a valuable machine, particularly when mounted on caterpillar traction, as it can be operated without in any way interfering with traffic and no other additional equipment is required in its operation. This machine is especially adapted for widening embankments where material can be borrowed from adjacent right-of-way and cast up into place, and the work can thus be done for about half the cost of that required by placing material by train haul. This machine can be employed to good advantage for cleaning out drainage channels and cuts when dirt is to be wasted or banked to form a dyke for the purpose of diverting side drainage away from the cut. A machine of this type should save its entire cost in one season's operation if properly employed.

All maintenance men dread the weed nuisance, as money spent for their destruction is in no way constructive and hand-weeding is very expensive; hence almost any other method that will effectually destroy them is profitable. One of the cheap methods employed in killing weeds is by burning, either with an oil flame, a heated plate, or super-heated steam; the most common, and probably the best, being the

first named, as the entire plant is consumed by the flame, thereby cleaning the track of vegetation. The average cost is about \$12.50 per mile, or about 50 per cent of that for hand-weeding, and requires the same number of operations per year as is required for hand-weeding.

In recent years, the chemical weed killer is being widely used, sodium arsenite being the agents. The chemical is diluted with water and is sprayed upon the roadbed, thus destroying the weeds. The cost of this method depends largely upon the price of arsenic, which has been reasonable for the past few years. Weeds can now be killed effectively for less than \$20 per mile of single track and one good application should last for the season; further, the soil retains some of the arsenic and re-growth is retarded. The cost of equipment for spraying is a minor consideration.

Track mowers, operated with section motor cars, are fast replacing the scythe in cutting weeds along embankment shoulders and pay big returns upon their cost.

On most railroads today the motor car is accepted as providing the most economical means for transporting maintenance men to and from their work, and is a very useful conveyance for distributing material. A motor car will save an average of one hour per day for the entire section gang as against hand car transportation; and the men are fresh and ready for work when they arrive on the job in the morning instead of being tired out from pumping a hand car.

The foregoing discussion covers only the more important roadway machines now in general use. Many other labor saving devices are also employed with resultant saving. It is unfortunate that too many of the older maintenance of way men are suspicious of new methods of performing their work and do not take kindly to the ready adoption of labor saving equipment. Therefore, when a new type of machine is furnished it is strictly up to the maintenance officer to see that it is put to constructive use and any possible prejudice dissipated.

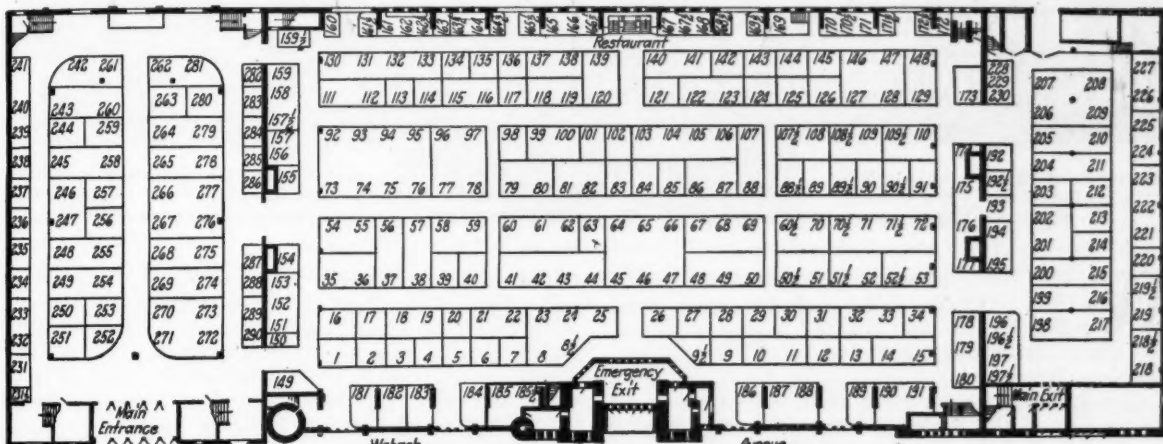
Plans for N. R. A. A. Exhibit Complete

PLANs for the exhibit of the National Railway Appliances Association to be held on March 7 to 10, inclusive, at the Coliseum, Chicago, point to the thorough success of this project which for the 19th time will be held concurrently with the convention of the American Railway Engineering Association. A total of 187 manufacturers of materials and appliances will present their products and as in previous years a number of applicants for space have had to be turned away. The exhibit will open on Monday morning, March 7, and close on Thursday afternoon. It will close daily at 6 o'clock except on Tuesday evening, when it will be open until 10 o'clock. The following is the list of exhibitors.

A C Spark Plug Company, Flint Mich.....	168½
Adams Motor & Manufacturing Company, Chicago.....	218-218½
Adams & Westlake Company, Chicago.....	96-97-77-78
Air Reduction Sales Company, New York.....	167-167½-168
American Cable Company, New York.....	284
American Car & Foundry Company, Chicago.....	253
American Casting Company, Birmingham, Ala.....	243-260
American Chain Company, Bridgeport, Conn.....	81-82
American Fork & Hoe Company, Cleveland Ohio.....	235
American Hoist & Derrick Company, St. Paul, Minn.....	84
American Railway Hydrant & Valve Company, Stapleton, S. I., N. Y.....	160
American Steel & Wire Company, Chicago.....	265-278
American Valve & Meter Company, Cincinnati, Ohio.....	130-131-132-133
Ames Shovel & Tool Company, Boston, Mass.....	186
Anchor Company, Milwaukee, Wis.....	163½-164
Anchor Post Iron Works, New York.....	261
Andrix Lock Nut Company, Adrian, Mich.....	161½
Armco Culvert Manufacturers' Association, Middletown, Ohio.....	99-100
Baker-Raulang Company, Cleveland, Ohio.....	205-210
Barber Asphalt Company, Philadelphia, Pa.....	163
Barrett Company, New York.....	189
Beall Bros., Alton, Ill.....	229
Beall Tool Company, East Alton, Ill.....	230
Beaumont Company, R. H., Philadelphia, Pa.....	159½
Bethlehem Steel Company, Bethlehem, Pa.....	70½-71-71½-72
Binks Spray Equipment Company, Chicago.....	172-172½
Blaw-Knox Company, Pittsburgh, Pa.....	89
Brach Manufacturing Company, L. S., Newark, N. J.....	2
Brown Rail Loader Company, Boston, Mass.....	192
Buda Company, Harvey, Ill.....	45-46-47-64-65-66
Carbic Manufacturing Company, Duluth, Minn.....	165-166-166½
Carey Company, Philip, Cincinnati, Ohio.....	194-195
Carnegie Steel Company, Pittsburgh, Pa.....	268-275

Carter Bloxonend Flooring Company, Kansas City.....	4
Celotex Company, Chicago.....	6-7
Central States General Electric Supply Company, Chicago.....	287-288
Chicago Bridge & Iron Works, Chicago.....	85
Chicago Malleable Castings Company, Chicago.....	142
Chicago Pump Company, Chicago.....	282
Chicago Railway Signal & Supply Company, Chicago.....	108½-109
Chicago Steel Foundry Company, Chicago.....	183
Chicago Steel Service Company, Chicago.....	165½
Chipman Chemical Engineering Company, Bound Brook, N. J.....	50½-51
Clark Car Company, Pittsburgh, Pa.....	117
Cleveland Frog & Crossing Company, Cleveland, Ohio.....	90
Cleveland Pneumatic Tool Company, Cleveland, Ohio.....	144
Cleveland Railway Supply Company, Cleveland Ohio.....	289-290
Copperweld Steel Company, Rankin, Pa.....	190-191
Creepcheck Company, Hoboken, N. J.....	214
Crerar, Adams & Company, Chicago.....	28
Cullen-Friestedt Company, Chicago.....	199-216
Cyclone Fence Company, Waukegan, Ill.....	252
Dearborn Chemical Company, Chicago.....	251
Detroit Graphite Company, Detroit, Mich.....	58-59
De Vilbiss Company, Toledo, Ohio.....	283
Dickey Clay Manufacturing Company, W. S., Kansas City, Mo.....	115-116
Dickinson, Inc., Paul, Chicago.....	88½
Dilworth, Porter & Co., Pittsburgh, Pa.....	27
Duff Manufacturing Company, Pittsburgh, Pa.....	35-36
Edison Storage Battery Company, Orange, N. J.....	20
Edison, Thos. A., Inc., Primary Battery Division, Bloomfield, N. J.....	18-19
Electric Storage Battery Company, Philadelphia, Pa.....	40
Electric Tamper & Equipment Company, Chicago.....	204-211
Elwell Parker Electric Company, Cleveland, Ohio.....	200-215
Engineering News-Record, New York.....	155
Euclid Electric & Manufacturing Company, Euclid, Ohio.....	203
Fairbanks, Morse & Co., Chicago.....	73-74-75-76-92-93-94-95
Fairmont Railway Motors, Inc., Fairmont, Minn.....	41-42-43-44
Frog Switch & Manufacturing Company, Carlisle, Pa.....	51½-52
Gannon Weed Cutter & Track Dresser Company, Farmington, Minn.....	231
General Electric Company, Schenectadv N. Y.....	270-271-272-273
General Railway Signal Company, Rochester, N. Y.....	48-49-50
Hackmann Railway Supply Company, Chicago.....	259
Handlan-Buck Manufacturing Company, St. Louis, Mo.....	264-279
Hayes Track Appliance Company, Richmond, Ind.....	140-141
Hazard Manufacturing Company, Wilkes Barre, Pa.....	21-22

Headley Good Roads Company, Philadelphia, Pa.....	157½-158-159	Oxweld Railroad Service Company, Chicago.....	10-11
Howlett Construction Company, Moline, Ill.....	250	Page Steel & Wire Company, Bridgeport, Conn.....	83
Hubbard & Co., Pittsburgh, Pa.....	86-87	Patterson Company, W. W., Pittsburgh, Pa.....	145
Illinois Steel Company, Chicago.....	269-274	P. & M. Company, Chicago.....	118-119
Ingersoll-Rand Company, New York.....	206-207-208-209	Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa.....	98
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Jewell Electrical Instrument Company, Chicago.....	125	Q. & C. Company, New York.....	120-139
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Jordan Company, O. F., East Chicago, Ind.....	60-61-62	Rail Joint Company, New York.....	79-80
Kalamazoo Railway Supply Company, Kalamazoo, Mich.....	8-8½-23-24-25	Railroad Accessories Corporation, New York.....	14-15
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Lehon Company, Chicago.....	91	Roberts Company, Geo. J., Dayton, Ohio.....	161-162-162½
Locomotive Finished Material Company, Atchison, Kan.....	143	Robertson Company, H. H., Pittsburgh, Pa.....	246-247
Lorain Steel Company, Johnstown, Pa.....	266-267-276-277	Robertson & Company, Wm., Chicago.....	184
Louisville Frog & Switch Company, Louisville, Ky.....	263-280	Roberts & Schaefer Company, Chicago.....	34
		Sears, Roebuck & Co., Chicago.....	219-219½
		Sellers Manufacturing Company, Chicago.....	124
		Signal Accessories Corporation, Utica, N. Y.....	113
		Simmons-Boardman Publishing Company, New York.....	102
		Sinning Track Liner Company, Ramsey, Ill.....	102



Floor Plan of Exhibit Space at Coliseum, Chicago

Lufkin Rule Company, Saginaw, Mich.....	121	Okonite Company, Passaic, N. J.....	16
Lundie Engineering Corporation, New York.....	90½	Sivyer Steel Casting Company, Milwaukee, Wis.....	234
Lundy Company, E. A., Pittsburgh, Pa.....	239-240-241	Skelton Shovel Company, St. Louis, Mo.....	9½
MacLean-Fogg's Lock Nut Company, Chicago.....	1	Snow Construction Company, T. W., Chicago.....	107½-108
MacRae's Blue Book Company, Chicago.....	286	Southern Signal Company, Louisville, Ky.....	238
Magnetic Signal Company, Los Angeles, Cal.....	3	Standard Oil Company of Indiana, Chicago.....	185
Maintenance Equipment Company, Chicago.....	137-138	Sullivan Machinery Company, Chicago.....	122-123
Malleable Screw Products Company, Cincinnati, Ohio.....	192½	Sunbeam Electric Manufacturing Company, Evansville, Ind.....	164½
Massey Concrete Products Corporation, Chicago.....	54-55	Superior Spike Company, Chicago.....	169
Mechanical Manufacturing Company, Chicago.....	245-258	Syntrom Company, Pittsburgh, Pa.....	201-202
Metal & Thermit Corporation, New York.....	198-217	Templeton, Kenly & Co., Chicago.....	32-33
Miller Train Control Corporation, Danville, Ill.....	249-254	Torchweld Equipment Company, Chicago.....	5
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Moss Tie Company, T. J., St. Louis, Mo.....	182	U. S. Wind Engine & Pump Company, Batavia, Ill.....	111-112
Mudge & Co., Chicago.....	127-128-146-147	Verona Tool Works, Pittsburgh, Pa.....	129-148
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National Boiler Washing Company of Illinois, Chicago.....	12	Warren Tool & Forge Company, Warren, Ohio.....	9
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National Lead Company, New York.....	187-188	Watt-Negus Automatic Train Control Company, Amherst, Nova Scotia.....	224-225
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National Safety Appliance Company, Chicago.....	149	Western Wheeled Scraper Company, Aurora, Ill.....	63
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Nelson Manufacturing Company, B. F., Minneapolis, Minn.....	13	Weston Electrical Instrument Corporation, Newark, N. J.....	237
Nichols & Brother, Geo. P., Chicago.....	173	Wharton & Co., Wm. Jr., Easton, Pa.....	52½-53
Northwestern Motor Company, Eau Claire, Wis.....	196-196½-197-197½	Wood Conversion Company, Cloquet, Minn.....	220
Ogle Construction Company, Chicago.....	31	Wood, Iron & Steel Company, Alan, Philadelphia, Pa.....	244
Ohio Brass Company, Mansfield, Ohio.....	248-255	Wooley Machine Company, Minneapolis, Minn.....	232-233
Ohio Valley Rock Asphalt Company, Louisville, Ky.....	150	Wyoming Shovel Works, Wyoming, Pa.....	101
Okonite-Callender Cable Company, Passaic, N. J.....	17		

B. & O. Uses Paint Spray to Advantage



Above—Painting the Inaccessible Parts of the Gable from the End of the Ladder

Expedites Work and Effects Economies by Providing an Outfit for Each Division



Above and Left—Painting Without a Ladder Where It Would Be Needed for Brush Work

WITH THE question of paint spray versus brush in maintenance painting still undecided in the minds of many bridge and building officers and their men, who are undoubtedly awaiting further developments in paint spraying equipment or more complete records as regards its adaptability to the work and the actual results being accomplished, the experience of the B. & O. with this type of equipment should be of interest. This is so, particularly because of the fact that this road's experience has demonstrated conclusively that a large proportion of its maintenance painting can be carried out more expeditiously and more economically with the intelligent use of its paint spraying equipment than is possible with the brush method, and furthermore, that the adaptability of mechanical cleaning tools to the spray painting equipment is of considerable further advantage.

As on other large roads, keeping up with its maintenance painting program in an orderly manner with forces of reasonable size has frequently been a problem on the B. & O. In the case of this particular road, this has been due in the main to two causes; strict adherence to brush painting, and the seasonal programming of its maintenance painting, the latter practice still being followed since the B. & O. has never found it practicable to carry on its painting work throughout the entire year, owing to the fairly uniform cold winters experienced over its lines. With brush painting the standard practice and with seasonal painting the rule, it was necessary, therefore, to build up a large painting force about the first of May of each year and to break it up about the first of November, after a crowded season of work which

might or might not have been completed. This also led to the contracting of a considerable portion of maintenance painting, usually the work on the larger buildings with large amounts of interior work, which it was found could be done satisfactorily by contract under the conditions imposed and at the same time preclude the necessity for building up an excessive temporary company force to handle the work expeditiously.

Paint Spraying Equipment on Each Division

While the B. & O. had been giving some consideration and study to spray painting, it was in connection with one of its contract jobs that it became particularly interested in the use of modern paint spraying equipment. This particular work was the painting of the interior of its new grain elevator at Baltimore in 1924, which presented a surface of over 3,000,000 sq. ft. to be painted. All of this work was done by the contractor with four two-unit paint spraying machines, and while it was recognized that in doing this work the machines were operating under ideal conditions as regards the character of the surface being painted, the computed results, showing an actual saving in cost of about 50 per cent over that of brush application, and the fact that the work was completed in about one-fifth of the time that would have been required ordinarily, was sufficient evidence to warrant the B. & O. in experimenting with similar equipment in its regular maintenance work with the view of reducing costs and carrying out its programs more expeditiously. In March, 1925, therefore, two paint spraying machines were purchased, of the same type as were used on the elevator work,

and were put in service on its regular bridge and building work. So satisfactory was the operation of this equipment throughout the season of 1925, and so conclusive were the results obtained in spite of its being the road's first experience in its use, that in April, 1926, the B. & O. purchased 13 additional machines, equipping each of its divisions with a unit and assigning an additional machine to each of the two divisions where the greatest amount of painting was to be done.

The equipment used on the B. & O. is a standard type heavy-duty paint spraying machine which consists essentially of an air reservoir, and a two-cylinder gasoline engine direct-connected to an air compressor, these being mounted on a unit-welded, channel-iron base, 73½ in. long by 48½ in. wide. It also includes two five-gallon material containers, two paint spray guns, and sufficient air and paint hose to permit a considerable range of painting each side of the power unit. An important auxiliary part of the equipment is a five-gallon solvent pail in which is kept gasoline, naphtha or other solvent used in cleaning the hose, guns, and other parts of the equipment. This pail also provides a place in which to keep submerged the funnel strainer and other screens used in preparing the paint.

In actual painting, one or both spray guns can be in operation at a time, a different color of paint being used with each gun if desired. This is made possible by an automatic unloader attachment on the air compressor which maintains a fixed pressure in the paint tanks under all conditions and thereby insures the proper atomization of the paint and the proper pressure at which it should be applied. When it is desired to change the color of the paint being used in the equipment, it is necessary only to change the paint in the containers and to cleanse the paint hose and guns with the solvent. This is done by substituting the solvent tank for the paint containers in the system, and forcing the solvent through the hose and guns.

With this equipment, little difficulty is now experienced on the B. & O. in securing good results, although a number of the customary troubles expected were encountered at the outset. These arose principally with gas engine and compressor parts and the clogging of nozzles, hose, nipples and connections, which in the main were caused by inexperienced operation and care of the equipment. By replacing defective parts, giving thorough attention to the instructions furnished with each machine, and by proper oiling, cleaning and improved maintenance, these difficulties have been largely overcome and relatively satisfactory operation is now being secured. During 1926, all of the spray painting equipment on the B. & O. was put in full service under a force which was fairly experienced in its use, and about 75 per cent of all of the maintenance of way painting was done with this equipment, the remainder being accomplished by the brush method.

Used on Both Large and Small Surfaces

The main division in the method of painting on the B. & O. has been between interior and exterior work, it having been found advisable under the present conditions to brush-paint the interiors of stations, office buildings and other occupied structures, particularly because of the desire to keep the atmosphere in these occupied buildings as free from paint as possible. Most of the exterior painting has been done, however, by the spray method, and in spite of the

general recognition of the fact that large unobstructed areas are painted most economically by this method, it is interesting to note that it has been found practical to spray-paint many small and broken surfaces. Among the larger structures painted have been station buildings, train sheds and both truss and girder bridges. All of these structures were painted more readily during the past year by the spray method and little actual difficulty was experienced in protecting adjacent surfaces not to be painted and also surfaces which had been painted already or which were to receive a different color.

As previously mentioned, the spray painting of large areas has been found to be most economical and no doubt the best results have been secured in this class of work. Advantages were demonstrated, however, in spray painting smaller surfaces, which led the B. & O. to use this method on such surfaces to a large extent. Thus, for example, a large amount of lattice work on truss bridges has been spray-painted although it was recognized that more paint would be lost in this work than if done by the brush method. On the other hand, it has been demonstrated that this loss was not excessive, that the work was accomplished more rapidly, and that it was possible to reach many places with a uniform coat of paint that could be reached with a brush only with great difficulty. It has been found, furthermore, that in general, the entire coat of paint applied by the spray gun is more uniform, particularly around rivet heads and at the intersection of members where the paint is forced close about the joints. In general, no difficulty has been experienced in manipulating the spray equipment in bridge painting, many of the painters finding it as easy to handle the spray guns while climbing about the bridge members, as it is to carry a brush and a bucket of paint. The amount of scaffolding used in connection with each method of painting has proved generally to be about the same.

Spray Painting Has Disadvantages

Some disadvantages have been encountered, of course, in the use of the paint spray in addition to those experienced at the outset. First, as already mentioned, there is some loss of paint, this occurring under even the most favorable conditions. The amount of this loss is estimated at from about 1 to 15 per cent, depending upon the character of the surface painted, the experience of the painters and the amount of wind to which the spray is subjected. On hot calm days or in confined quarters, spray painting is often less pleasant work for the gun operator than brush painting, owing to the richness of the atmosphere about the work due to the fine particles of the spray which do not adhere to the surface being painted. This disadvantage was not experienced to a large extent on the B. & O., however; in fact, it has been quite infrequent when it has been necessary for an operator to wear any form of a mask to keep from inhaling paint particles.

Other disadvantages of the paint spraying equipment as operated on this road include the necessity in some cases of having to go over, or to touch up with a brush, the edges of small angles or plates, and the necessity of having to move and clean the additional equipment which spray painting involves. This latter disadvantage has been one of particular importance where the size of the structure does not warrant the expense of moving, preparing and cleaning the outfit in order to do the job. In such

instances, brush painting by hand usually proves cheaper.

Offsetting these disadvantages, however, are the actual advantages and economies which have been effected by the use of the paint spraying equipment. In the first place, spray painting on the B. & O. has been done at an actual saving, reports on individual jobs having indicated savings in labor costs ranging from 40 to 50 per cent of the cost of brush painting. At the same time the work has been accomplished in from about one-half to one-quarter of the time. This in turn made it possible both to minimize the size of the painting forces, reducing the annual turnover in the organization, and at the same time, to complete the season's work in a more orderly manner. The other important advantage demonstrated by the paint spray, as already mentioned, has been the ability to paint places inaccessible or difficult to reach with the brush.

As regards the quality and durability of the paint coat applied by the spray method, no definite answer is available on the B. & O., as even the first applications by this method have not yet been subjected to sufficient test. It has been noted, however, that in many instances the spray-applied coats of paint appear to be more uniform, and furthermore, that the earliest paint spray work appears to be standing up as well as brush work done at about the same time.

Comparable Cost Data Hard to Obtain

As is to be expected, there has been considerable variation in the relative costs of completed jobs, and, due to the fact that identical jobs were seldom handled by both methods on the same territory, equitable comparative data are hard to obtain. A typical case of identical types of frame station buildings reported by one division during the past summer, however, is illustrative. This comparison shows:

Labor Cost			
	\$0.0279	per sq. ft.	
By Hand.....	\$6.20	per gal. of paint	
	\$0.0117	per sq. ft.	
By Spray.....	\$1.80	per gal. of paint	
A summary of 40 jobs, 20 by each method on the same division shows the following results:			
	Expense		Labor expense per
	Material	Labor	\$1.00 of material used
By Hand.....	\$255.00	\$606.00	\$2.38
By Spray.....	\$392.00	\$718.00	\$1.83
Saving in Labor.....			23 per cent

In this comparison, labor costs of cleaning are not included, the above items covering only costs of handling the equipment and making the paint applications. The structures included in the above comparison cover passenger stations, freight stations, water tanks, tool houses, camp buildings, telegraph offices, scale houses and sheds, being in general the smaller outlying structures of the road.

Careful Programming Expedites Work

In accomplishing maintenance painting on the B. & O. it is the practice to follow definite painting programs mapped out on each division early in the year. These programs are made up by the division engineers and are based to a large extent upon personal inspections and the recommendations of the master carpenter, who on each division is in direct charge of the painting equipment and work. When the separate programs have been approved by the several engineers maintenance of way and the chief engineer maintenance of way, they are put into effect as early in the spring as is practical, arrangements

having been made in advance to have the necessary paints and other materials on hand, and to have the painting equipment in good operating condition.

The painting force on each division is made up largely of men from the regular forces of the bridge and building department, these men being released for this special work during the summer and taken back into the regular bridge and building gangs again in the fall without losing their seniority. The remainder of the painting forces is hired specifically for this work and is released when the season's work is completed. While this practice has been followed with considerable difficulty on some roads, owing to the class of men it has been necessary to employ and the less satisfactory results accomplished, these difficulties have not been experienced to any extent on the B. & O. it, apparently, having been able to secure a fairly intelligent and experienced group of painters each year who do satisfactory work, especially when absorbed in the skeleton organizations formed from the regular forces.

The size of the painting forces depends, of course, upon the extent of the painting programs, which on some divisions vary considerably from year to year. Likewise the size of the individual gangs varies according to the magnitude of the job and the amount of brush work to be done. Ordinarily the force employed with each paint spray outfit on bridge work consists of a foreman and three or four men, two men to manipulate the guns and the other men to prepare the paint, attend the operation of the power unit, keep scaffolding arranged in advance of the gun operators, and to do such cleaning work as is necessary. These men also relieve the gun operators from time to time, who then assume the duties of carrying out the auxiliary work.

On building painting the gang also varies with the size of the job and according to the necessity of supplementing the spray by some hand work on the trim, window-casings, etc., although it has been found that a man fairly expert with the use of the gun can readily handle most trim work of this character.

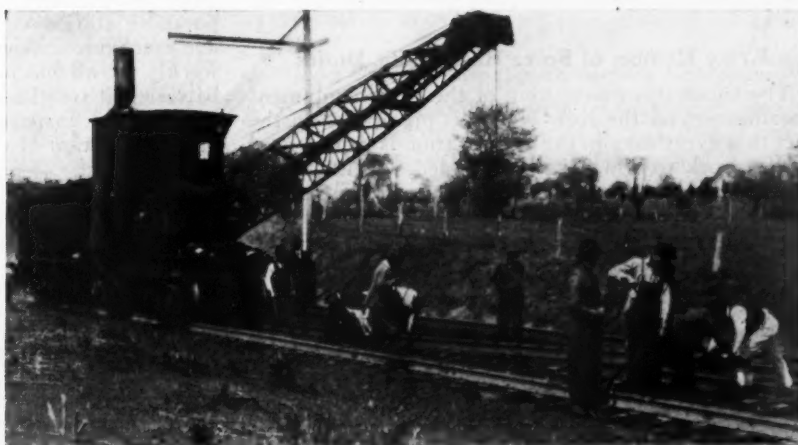
In following out the painting program on each division, it is the usual practice to begin at a specific point and to work in one direction, painting all structures included in the program as they are reached. The paint spray outfit, as well as the painting materials, brushes and other equipment of the painting gang, is carried from place to place on a trailer car which is moved over long distances by a regular section gang motor car. On comparatively short moves, the trailer with the equipment can be pushed about by the painting forces.

When in operation, the paint spraying machine is generally set off from the trailer, primarily to clear the track, but also because of vibration set up. Exceptions to this occur, however, when painting small structures out on the line where it is not convenient to set off the equipment or where the outfit can be operated for a short time more conveniently on the trailer and the same time not interfere with traffic. On large jobs the equipment is usually carried from one location to another by six men. The number of movements on a particular job is not usually large, however, owing to the wide range of the spray guns with each setting of the machine.

All of the maintenance painting work on the B. & O. is under the general supervision and direction of E. Stimson, chief engineer maintenance, to whom we are indebted for the information as to results obtained on the B. & O. with this method of painting.

Proper Supervision and Maintenance of Equipment Are Essential

An Outline of the Organization and Practices on the New Haven Where This Truth Has Been Recognized



IN SPITE of the high class and efficient labor-saving equipment offered generally to the railroads during the last few years, one thing seems to be more and more apparent to railroad maintenance officers as the number of such units of equipment increases and as their use becomes more general; this is, that there are certain fundamental practices which must be followed in the care, operation and maintenance of such equipment if long life and maximum usefulness and efficiency are to be secured from the equipment. In the main, these fundamental practices include care in the selection of each unit of equipment to insure its practicability and adaptability to the work in hand; care in the selection and the training of the men or forces who are to operate the equipment; the intelligent assigning of the equipment so as to keep it busy and most effectively employed; and organized and systematic provision for its inspection, care and repair so that minimum delay will be encountered while it is on the job and so that the maximum life can be realized from the equipment.

Assuming that there is an actual need for such equipment and that the proper kind and numbers of each type have been purchased, the next and equally important fundamental requirement with regard to the equipment is that it be maintained to a high standard at minimum cost and with minimum delay to its effective use. This is evident, for it is recognized readily that regardless of the character or quality of the equipment purchased, its proper assignment and intelligent operation cannot be effected nor its maximum efficiency and ultimate service life realized, unless the equipment is in good working order and maintained in that condition. The carrying out of the other requirements, from the maintenance standpoint, is also a very important matter, primarily because of the very direct effect that operation and assignment can have on the character and cost of maintenance. For example, the care exercised in the selection and training of the operators of the equipment can lead to either experienced and careful operation and maintenance, or to inefficiency and carelessness; and the assignment of the equipment to certain classes of work or to certain territories can affect materially the way the equipment will

stand up and the promptness with which inspections and repairs can be made.

Recognizing this inter-relationship between the operating and maintaining of labor-saving equipment, several roads owning and operating a large amount of such equipment have found it advisable to build up a special organization with full charge over the operation and maintenance of their equipment. Usually, this organization is small in size, and is headed by a responsible and experienced man who is given direct charge over all equipment and its repair, as well as a major part in the selection, training and promotion of work equipment forces. This man is generally given the title of supervisor of work equipment, and is required to report to only one officer, usually the engineer maintenance of way.

The Organization on the New Haven

A road where such an organization has been worked out in some detail and developed to considerable efficiency is the New York, New Haven & Hartford. On this road, where labor-saving equipment is used extensively, the development of the equipment maintenance organization has been by stages, the organization having been enlarged in size, jurisdiction and scope as the number of units on the system increased and the necessity for centralized and unified supervision became more apparent.

The present organization, which was formed about 1917, consists of work equipment inspectors, motor car mechanics, gas engine mechanics, and an electric vehicle mechanic, all of whom are responsible to and report direct to a supervisor of work equipment. Included within this organization are also the forces operating the work equipment who come under the direct supervision of the supervisor of work equipment, and who report to him either direct or through the work equipment inspectors or mechanics.

This organization, scattered over the system and yet unified by centralized direction, is responsible for the inspection, care, operation, upkeep and road repair of most of the New Haven's labor-saving equipment. Carrying out all of these responsibilities is a problem of considerable magnitude as this equipment

includes over 600 separate units, among which are locomotive cranes, steam shovels, ditching machines, pile drivers, rail loaders, spreaders, motor cars, tie tamper compressors, one-ton gasoline motor trucks, paint spraying machines, sand blast compressor cars, water station pumping units, and electric tractors and trucks.

Every Member of Force Has Specific Duties

The successful functioning of the work equipment organization on the New Haven is predicated on the fact that every man in the organization is experienced in the work to which he is assigned, whether it be inspection, operation, or repair, and furthermore, that every man is schooled in the duties which he is to carry out and the reports he must make. Thus, every operator of a unit of equipment knows that he is held responsible for the output and care of his specific unit, and that he must arrange promptly for all maintenance or repair work which may be necessary, this arrangement to be made with one of the inspectors or mechanics, or direct with the supervisor of work equipment. Supplementing his regular work and the making of such auxiliary reports as may be required from time to time, he is required to make a



Stripped, Greased and with the Engine Enclosed for the Winter

written report each week on a standard form, showing the amount of work which has been accomplished by his machine, the hours consumed, and the condition of the machine.

Briefly, the duties of the work equipment inspectors require that they make a general inspection of all work equipment located on their respective territories at least once a month; that they arrange and assist in making all running repairs; and that they make daily reports of their work to the supervisor of work equipment. The motor car mechanics make all repairs, except shop overhauling, of all gas engine equipment on their respective territories, and as far as possible, endeavor to make monthly inspections of

each unit of such equipment. These men are also required to make daily production and inspection reports to the supervisor of work equipment.

The gas engine inspectors are depended upon for the out-of-shop maintenance and repair of gas engine compressors, paint spraying machines and pumping station equipment, while the electric vehicle mechanic makes at least one general inspection weekly of all electric tractors, trucks, and storage batteries at freight and baggage transfer points. In making such inspections, it is his duty to make note of the condition of each unit and to arrange for and



Careful Maintenance Keeps This Outfit in Condition for Immediate Service

follow up all running repairs, making recommendation to the supervisor of work equipment, for such shop repairs as may be required.

The duties of the supervisor of work equipment are many and varied since he has direct jurisdiction over all work equipment and its repair and operating forces. Some of these duties include the hiring and maintenance of the force of operators, inspectors, mechanics, and all other employees detailed to handle the work equipment of the maintenance of way and construction departments; the instruction and training of the men and the assigning of them to their respective jobs; and the detailing of work equipment inspectors and mechanics to special work. In addition, he co-operates with the heads of the various departments in the assigning and maintaining of the equipment most suitable for the work to be done; he makes recommendations for the shop overhauling of equipment; he provides the stores department with data on the stock of materials and parts to be carried for the maintenance of equipment; and he despatches these materials and parts from the stores department to the various units of equipment as they are needed. He also prepares records of performance of the work equipment, including the cost of operation and maintenance, and makes personal inspection tours of the system, checking up on all of the equipment for which he is responsible and arranging for prompt attention to matters which may not have already been brought to his notice.

Simplicity of System Enables Speedy Repairs

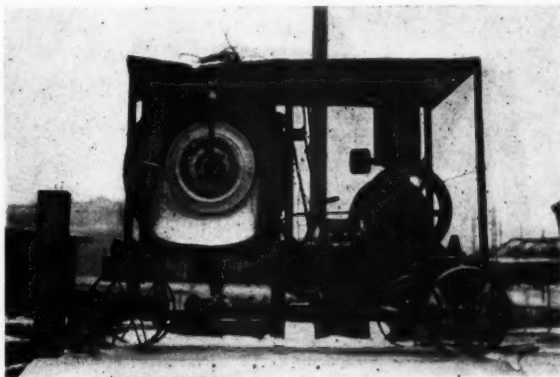
With each man following out the duties assigned to him in the New Haven's organization, the work equipment on that road is not only maintained to a high standard but little delay is experienced in work due to the breakdown of equipment or the failure of a part. If such a breakdown or failure should occur and repair be urgent, the operator or foreman gets in touch immediately with the nearest inspector

or mechanic by wire or phone, and explains the failure and the part or parts desired. If he should not be able to reach the inspector or mechanic, he wires or phones the office of the supervisor of work equipment direct, making request for the part or parts needed. In doing this he gives, as far as is possible, the number or other designation assigned to the various parts in the standard book of parts covering the specific machine with which he is connected, a copy of this book being kept in his possession for this purpose.

In order to expedite matters, he may get in touch with both an inspector or mechanic, and the supervisor of work equipment, so that if the inspector or mechanic is needed, he can arrange to get to the disabled equipment promptly, and also so that minimum delay will be encountered in securing the needed part from the storehouse.

When such a request is received at the office of the supervisor of work equipment from an operator, foreman, inspector or mechanic, a special requisition is made out and sent to the stores department by messenger, or is telephoned to the storekeeper and sent in writing later, requesting that the part or parts be shipped promptly to a specific point by baggage. In this way, emergency cases are handled in a minimum of time, with the least delay to the unit of equipment and minimum delay to its operating force which may have to remain idle until repairs can be made.

Where repairs or parts are required less urgently, a requisition is usually sent by railroad mail; on the other hand, if a small part is needed most urgently, and is not in stock at the storehouse, but can be purchased near the equipment, special arrangement can be made with the office of the supervisor of work equipment, over the phone or by wire, to purchase such a part on the ground, a special purchase order



High and Dry for the Winter

number being assigned by the purchasing department and forwarded by the supervisor of work equipment, authorizing the purchase of this part.

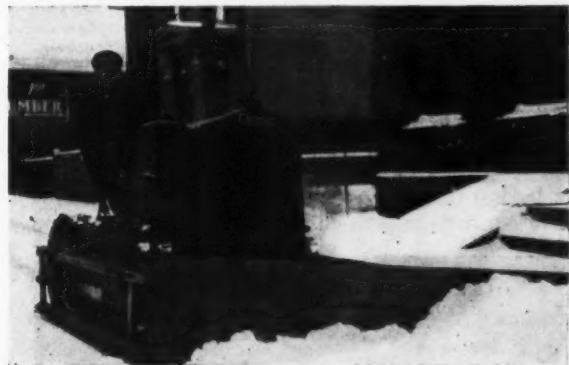
In this way all requisitions clear through only one office. This not only speeds up emergency and regular repairs and the despatch of needed materials and parts, but also enables the keeping of a constant check on all materials and parts withdrawn from the storehouse and assigned to the various units.

Routine maintenance and repair of equipment on the New Haven are, of course, handled by the operators of the equipment and by the inspection and repair forces, as is also the light overhauling of some equipment. This latter work is handled in the field

principally to expedite carrying it out and to avoid losing the service of the equipment during the longer time that would be required if units were sent into the shop for such work. Where complete overhauling is necessary, or where the equipment can be taken out of service at certain seasons without interfering with work, such overhauling is done at the company's shops.

Good Care Is Also Taken of Idle Equipment

With the care of each unit of equipment directly up to the operator in charge of it, and closely supervised by the inspectors and supervisor of work equip-



The Experience of the Operator Often Determines the Efficiency of Labor Saving Equipment

ment, it is not surprising that the equipment on the New Haven is generally found clean and in good working condition. This care is taken not only while the equipment is in use, but extends also over the periods when the equipment is idle. Thus, the smaller units are always put away in good condition, under cover, and amply protected against abuse or damage. With the larger units of equipment, it has not been found practical to put them under cover when not in use, but if such equipment is to stand idle for any length of time, care is always exercised to see the boilers are drained and cleaned, that exposed bearings are protected thoroughly by grease or white lead, and that all brass fittings and connections are removed which might be tampered with or stolen.

The Make-Up of the Organization Is Important

The success of an organization such as has been outlined is, of course, dependent on a number of specific things, not the least of which are the class and morale of the men making up the organization, and their specific fitness for the work to which they are assigned. Recognizing this fact, the work equipment forces on the New Haven are selected and promoted with great care, promotion being usually from within the ranks so as to stimulate interest and initiative among the men. This also insures an ample supply of trained operators who, through their connection with the equipment in other capacities, have become thoroughly acquainted with it. Supplementing this practical experience of its men, it is the practice of the New Haven to put new operators through a short course in an engineering school, this course being selected to best fit the needs of each individual operator in enabling him to understand thoroughly the operation of the particular equipment under his care.

In order to keep a good class of men and to avoid

a frequent turnover in the work equipment force, an attempt is made to program the use of the equipment so that it will be possible to maintain the force intact throughout the year. In a further effort to attract and hold good men, each of the larger units of equipment on the New Haven is supplemented with a comfortable and neatly kept living car for the equipment crew. This not only accomplishes the purpose in mind but also has the advantage of keeping the operating crew with the equipment at all times, which, in turn, leads to greater interest in the equipment and less loss of time in going to it and leaving it on the job. In addition, this arrangement precludes the tampering with the equipment by unauthorized persons or the theft of materials.

Such an Organization Has Many Advantages

The advantages of such an organization and system of maintaining labor-saving equipment as has been outlined and described, are many and varied. Some of the more important of these are as follows: it leads to the purchase of better equipment; it enables a higher standard of maintenance through



Snowed in But Fully Protected by Grease

skilled forces; it centralizes authority and responsibility for the work and speeds up repairs, precluding delays and unnecessary red tape in securing parts or necessary repair work; it leads to closer supervision and a better class of operators and tends to stabilize the force; it permits of the more extended standardization of parts and repairs, which in turn, together with the system of enabling the prompt receipt of parts on requisition, minimizes the stock of repair parts to be kept on hand; it permits of a closer check on all repair work and parts assigned, and thereby facilitates the accurate recording of the maintenance costs of each unit of equipment; and of large importance, it also extends the life of the equipment, insures its more effective assignment, and leads to its more efficient and extensive use.

All of these advantages, it is felt, are being secured on the New Haven to a greater or less extent through its relative small work equipment organization formed in 1917 and placed under the direct supervision of F. F. Zavatkay, supervisor of work equipment, to whom we are indebted for the information contained in this article.

NO ACCIDENT RECORD.—A period of more than 39 months has elapsed since an employee of the Northwestern Pacific has been killed in an accident while on duty, and there were fewer accidents at crossings on that road in 1926 than there were in 1925.

Increased Wages Granted to Canadian M. of W. Employees

THE Railway Association of Canada and the United Brotherhood of Maintenance of Way and Railway Shop Employees recently agreed upon a new wage schedule, effective January 16, 1927, which revises Section 22 of Wage Agreement No. 7 dated June 15, 1925, and provides higher rates of pay for maintenance of way employees.

The railways parties to this agreement are the Canadian National, the Canadian Pacific, the Dominion Atlantic, the Esquimaux & Nainimo, the Fredrickton & Grand Lake, the Grand Trunk, the Grand Trunk Pacific, the Kettle Valley, the New Brunswick Coal & Railway, the Quebec Central and the Temiskaming & Northern Ontario.

The new rates of pay for the principal classes of labor are shown together with the old rates in the tabulation from which it will be noted that the increases average about two cents per hour.

	New Scale	Former Scale
Section foremen, 1st class yard..per day	\$5.00	\$4.80
Section foremen, 2nd class yard..per day	4.90	4.70
Section foremen, 3rd class yard..per day	4.75	4.60
Section foremen, 4th class yard..per day	4.70	4.55
All other section foremen.....per day	4.55	4.40
Asst. section foremen in yards..per day	4.55	4.40
Other assistant section foremen:		
Five cents per hour in excess of rate paid section men on sections on which they are employed.		
Foremen of extra gangs.....per day	5.10 to 5.60	4.70 to 5.50
Assistant foremen of extra gangs, min. ....per day	4.55	4.40
Snow plow or flanger foremen.....per day	5.55	5.40
Section men, classified yards.....per hour	0.41	0.38
Other section men, first year.....per hour	0.38	0.36
Other section men after 1st year.....per hour	0.40	0.38
Bridge and building foremen.....per day	5.60	5.30
Painter foremen .....per day	5.25	5.00
Mason, concrete, bricklayer and plasterer foremen.....per day	5.60	5.30
Pile driver and hoist engineers..per day	5.00	4.85
Lidgerwood engineers, when M. of W. employees required to perform service.....per day	5.00	.....
Carpenters .....per hour	.58 to .62	.56 to .60
Bridge men and rough carpenters .....per hour	.48 to .58	.46 to .56
Painters .....per hour	.58	.56
Plumbers .....per hour	.72	.70
Pipe fitters .....per hour	.72	.70
Tinsmiths .....per hour	.72	.70
Blacksmiths .....per hour	.72	.70
Rail welders .....per hour	.72	.....
Pump repairers .....per hour	.72	.70
Masons (minimum of).....per hour	.62	.56
Bricklayers (minimum of).....per hour	.62	.56
Plasterers (minimum of).....per hour	.62	.56
Helpers to all classes of mechanics .....per hour	.46	.44
Pump men (one pump).....per month	91.00	87.00
Pump men for each additional pump .....per month	6.00	6.00
Signalmen at interlocked crossings .....per month	95.00 to 110.00	90.00 to 105.00
Track and bridge watchmen.....per hour	.39	.37
Track patrolmen regularly assigned as such .....per hour	.41	.....
Bridge and building laborers at terminals West of Port Arthur and Superior Jct.....per hour	.40	.37
Signalmen or watchmen at highway or railway non-interlocked crossings .....per hour	.38	.36
Signalmen or watchmen at highway or railway half-interlocked crossings .....per hour	.40	.38
Bridge tenders (manual operation) .....per hour	.38	.36

The only important change in the rules is the establishment of a differential for section men on sections which have more than two miles in tunnels, where the section men are paid two cents per hour in excess of the regular rates, and the foremen receive 15 cents per day more than the regular rate, with a proviso that their rates are not to exceed those of foremen in first class yards.

What's the Answer?

What Our Readers Have to Say on Current Questions That Perplex Those Engaged in Maintaining Tracks, Structures and Water Supply Facilities



QUESTIONS TO BE ANSWERED IN THE MAY ISSUE

1. When cleaning ballast is it necessary to clean the ballast in the cribs between the rails, or is it sufficient merely to clean the ballast on the shoulders in order to secure proper drainage?

2. To what extent is a railroad justified in using oak bridge ties instead of yellow pine or Douglas fir?

3. What are the relative merits of hand operated hacksaws and track chisels for cutting rails?

4. What are the relative advantages and disadvantages of painting railway buildings by contract or by company forces?

5. Is it worth while to place monuments on the shoulder of the roadbed to show the beginning and end of curves and spirals and to mark thereon the superelevation to be used?

6. What precautions can be taken to prevent float valves becoming inoperative from freezing?

7. What are the relative merits of side load and center load motor cars for inspection purposes?

8. What is the best rig for pulling sheet piles?

Portable Air Compressors for Bridge Work

What uses may be made of portable air compressors by bridge gangs, aside from riveting?

They Effect Economies in Many Kinds of Work

By J. S. HUNTOON

Assistant Bridge Engineer, Michigan Central, Detroit, Mich.

The use of compressed air for bridge work other than riveting has effected economies by means of air-operated tools which will perform more work with fewer men than would be required with hand labor. The more common applications of compressed air are found in drilling holes for anchor bolts and dowel pins, operating drills and chipping hammers for repairing structural steel members, and boring holes for timber construction. Pneumatic hammers are also used for driving drift bolts in trestles.

The pneumatic spade is of great assistance in excavating heavy blue clay which is too hard to be handled economically by the ordinary pick and shovel and an air jet has been used successfully to loosen the soil around piles which are to be pulled, thus saving the additional equipment that would be necessary if a water jet were used.

An air jet may be used to advantage to remove chips and other refuse before placing concrete where complicated systems of reinforcing bars render the work difficult of access. The cleaning of structural steel for painting by the sand blast and the application of paint by a spray operated by compressed air are performed more rapidly and economically than

can be done by hand labor, especially when the surfaces are difficult to reach with hand tools.

Compressed air as a source of power for operating tools on bridge maintenance or construction, has shown its value in so many ways that it would be difficult to get along without it.

They Can Be Used to Operate Many Labor-Saving Tools

By G. W. MORROW

Representative, Ingersoll-Rand Company, Chicago

Aside from the most widely known use of the portable air compressor for furnishing power to operate riveting hammers, there are numerous other applications in which great savings can be obtained by the use of air driven appliances and straight air in the construction or maintenance of bridges, culverts or other structures. Air-driven tools are light to handle and there is little delay during the work due to breakdowns.

An air drill used for reaming and drilling steel will drill 20 holes in the same time that one man will drill one hole with a hand drill. This saving cannot always be measured in actual labor but can be multiplied many times in such work as drilling under drawbridges when the span would have to be lifted in a short interval of time on account of traffic. Wood boring drills driven by compressed air may be used for a variety of work, such as boring guard rails, heavy stringers, caps or piles, and by slight changes may be converted for use in applying lag screws. A new type of air driven circular saw, with an automatic safety device, will be found very useful in framing timber, trimming planks and cutting

away the smaller members in trestle work where replacements are to be made. This one-man saw is light and can be used in close quarters that would be inaccessible for hand work. Air-driven chipping hammers are the quickest and cheapest means of cutting out old rivets and steel to make way for new parts.

When preparing steel structures for painting, the air-driven wire brush or sand blast will clean the surface quickly where smoke, light scale, etc., have accumulated, but for heavy scale the scaling hammer or scaling tool will do more efficient work. A new scaling tool is adaptable to all surfaces and can be worked in tight places or corners which the ordinary hammer or brush cannot reach. The wire brush may be used as a grinder by slight changes.

Almost any painting job can be done quicker and better with an air-operated paint spray. This is particularly true where large surfaces are to be covered, or where there are angles and corners that cannot be reached with hand brushes. This spray method is also used for handling other liquids, such as waterproofing, whitewash, etc.

Where it is necessary to drive sheeting for foundation or culvert work, the pneumatic pile driver will drive sheeting at the rate of two to seven feet per minute, depending on earth conditions, and will not broom out the top of the pile. Two men with this tool will replace 8 to 12 men with mauls. By slight changes this tool can be adapted to driving drift bolts or spikes for wharf or trestle work, and will save a great deal of time and labor in breaking up concrete foundations, hard frozen ground, cutting asphalt or tamping material.

Cement guns operated by air from a portable compressor have proved economical. Some of the common uses are the repairing of stone masonry, piers, etc., as well as the coating of timber for fire protection, lining tunnels, stucco work, etc. An air hoist has many applications, such as hoisting bridge members, light structural steel, drag line work, etc.

There is work for the portable compressor the year round and when not used for bridge work may be utilized for the furnishing of power to operate tools for tie-tamping, breaking up hard or frozen ground or ice, blowing snow from switches, drilling rock, pumping water, or, in emergencies, to furnish air for pneumatic car retarders, switches, signals, or any purpose requiring air up to the capacity of the compressor.

The Distribution of Ties by Motor Cars and Trailers

To what extent can the distribution of ties be done more economically by motor cars and trailers than by work train?

Motor Cars and Trailers Effect Saving in Labor

By T. P. O'NEILL

Engineer Maintenance of Way, Colorado & Southern,
Denver, Colo.

Ties cannot be unloaded satisfactorily from work trains in territories where there are deep cuts and high fills as the ties unloaded in the cuts will fill the ditches and many of those unloaded on the fills will go over the sides of the roadbed. For such conditions it is advantageous to unload and pile the ties neatly in station grounds or at level places along the line and then distribute them by motor cars and trailers as needed. The places for unloading should

be selected so as to take advantage of the grades in distributing the ties.

The number of ties hauled out on each trip depends on the size of the gang, averaging about 5 ties to the man; thus, 10 ties for a 2-man gang, 15 for a 3-man gang and so on up to a maximum of 40 ties. Not more than two days' supply should be distributed at a time as ties look much neater when piled up than they do scattered along the track. This method of distributing ties effects a great saving in labor.

The section foreman should get a line-up on trains before starting the distribution and proper flag protection should be provided in all cases where the view is obscured in any way.

Depends Largely on Density of Traffic

By F. C. HUFFMAN

Assistant Chief Engineer, Chicago & North Western, Chicago

The relative economy of these two methods of distributing ties depends on several conditions such as the density of traffic, the time of year the ties are received for distribution and the forces available.

We use motor cars with trailers to a very large extent for distributing main line ties received during the fall, winter and early spring, as we find it more economical to unload them in station grounds during that period and then distribute them along the line by motor car during the working season.

Many of the ties received during the working seasons on outlying divisions where the traffic is light are distributed by way freight or other regular trains. Also the use of motor cars for distributing ties is restricted in heavy traffic territory since it is neither safe nor economical under such conditions.

About 60 per cent of our ties are unloaded in station grounds and then handled by motor cars, but this practice varies, depending on the conditions as noted above.

Traffic Conditions Often Make Work Train Uneconomical

By J. D. KEILEY

Supervisor, Chesapeake & Ohio, Russell, Ky.

The relative economy of the distribution of ties by motor cars and trailer or by work train is dependent on whether the work is done on single or multiple track, the traffic conditions and the location of crossovers and side-tracks.

In any case the cost of unloading ties by work trains can be very materially lowered if the ties are loaded at the treating plant in bundles with wire slings left around them so that they can be unloaded by a hoist. The derrick or hoist can set them in a pile clear of the running track, whereas if the ties are unloaded by hand, they are thrown from the cars, usually tearing up the roadbed and then must be stacked by hand into piles.

In tie renewals much time and money can be saved by the foreman having each mile of his track spotted and knowing exactly where and how many ties he is going to use in each mile. This should be on paper so there will be no chance for mistake and he will then know definitely how many ties to unload and where to unload them.

Where the traffic conditions are heavy it is more economical to unload the ties and then distribute by motor car and trailer. In unloading ties by hand it

usually requires a large number of men and when the work train goes in the clear the men are sitting around doing nothing with the result that the time is a dead loss. When distributing the ties by motor car and the foreman is handling his motor car and trailer he can usually find work for his men to do while waiting for train movements.

Where traffic conditions will not interfere to too great an extent the ties should be distributed by work train according to the record of ties to be renewed as each rehandling costs money and is a dead expense if it can be avoided.

Classifying Relay Rail

Should released rail be classified for relaying before it has been loaded or should the classifying be done at some central point?

It Depends on the Refinement Required

By BERNARD BLUM

Engineer Maintenance of Way, Northern Pacific, St. Paul, Minn.

The answer to this question depends largely on the degree of refinement required in the classification. Rails that do not require sawing but are to be segregated into classes varying in height by 1/64 in. should be classified at a central point. The batter should be determined with a taper gage and it is difficult and laborious to do this on the ground.

On the other hand, if it is desired only to sort the rails into four general classes: Those suitable for branch line relay without sawing; those suitable for branch line relay after sawing and drilling; those suitable only for yard tracks; and those to be scrapped, the classification should be made on the ground before the rail is released from track, thereby securing the following advantages:

1. The rails are bright and clean and defects such as pipes, split heads, broken bases, etc., can be detected more readily.

2. The rails can be loaded on cars and shipped directly to the points where they are to be used, thus avoiding, in some cases, long hauls to and from the central point.

3. It is cheaper to load the various classes of rail on separate cars than to load all classes on the same car and then unload, classify and reload at a central point. Experience will enable the inspector to determine by eye whether or not the ends are battered beyond the maximum permissible amount and must be sawed and drilled.

The Classifying Should be Done at a Central Point

By THOMAS STALEY

Timekeeper, Michigan Central, Jackson, Mich.

Rail released from main tracks where the roadmaster has only one rail loader at his disposal should be sent to some central point to be classified. If the rail is to be sawed the proper place to make the classification is at the sawing plant. The facilities for inspection are much better at a central point than they are along the track and the rail can be loaded more economically by picking it up out of face than where the same stretch must be worked over several times to load the different classes on separate cars, an important consideration on heavy traffic lines.

On roads having no fixed standards for classification there is not always uniformity when the rail is

classified on the ground and this sometimes engenders ill-feeling between the shipper and the consignee when the rail is to be relaid on another division. By making the classification at a central point the work can be standardized and thus remove many causes of friction. When rail has been sawed for relay the ends should be calipered and marked as a guide in laying so as to secure as uniform joints as possible to assure a smooth riding track.

Rails Should be Classified in the Track Just Before Being Removed

By B. F. HARRISON

Roadmaster, Missouri-Kansas-Texas, Hillsboro, Tex.

Rails should be inspected and classified in the track just before they are removed as the defects most to be feared, such as pipes, fissures and many web defects, cannot be detected a few days after they are removed from the track. These defects are visible as long as the rail is under traffic on account of the slight discoloration on the top of the rail or the small break in the rust just under the bolt and on the web. After the rail is released a coat of rust soon forms which hides the discoloration on the top of the rail and other indications of defects.

By using a sufficient number of colors to indicate the desired number of classes, rail in the track can be inspected, classified and marked more thoroughly and at less expense than at any other time. After the rail is released the joint bars should be removed and a careful inspection made for any defects that may have been hidden.

Since rails cannot be classified properly until after inspection, and since the inspection cannot be made properly after the rails have been removed from the track why not do both jobs at once and save time and money?

Classification Should be Made When Rail is Released

By D. J. SHARPE

Roadmaster, Chicago, Burlington & Quincy, Centerville, Iowa

Rail should be classified before it is loaded and shipped to a central point for distribution. When rail is unloaded at a point of concentration and allowed to remain in stock exposed to the weather it becomes difficult to determine defects and makes proper classification impossible. It has been my experience that rail classified under these conditions and relaid often shows defects existed when the rail was released from track. For these reasons relay rail should be inspected and classified when first taken out of track.

Rail Should be Shipped to a Central Point for Classification

By W. C. VANDIVER

Supervisor, Louisville & Nashville, LaGrange, Ky.

All released rail should be shipped to some central point to be classified, where the angle bars should be removed to see that the bolt holes are not too badly worn and that there are no breaks through the base or web of the rail near the end, as often occurs when the joints are battered. By handling rail in this manner it can be picked up whenever the availability of work trains or traffic conditions are most favorable without having to take into consideration the question of having it classified before it is picked up, which sometimes causes delay. When

the rail is classified in a yard it can be piled according to classes and can be loaded easily and quickly to supply rail for any particular purpose.

Relay rail should be classified as follows:

No. 1. Rail with a full head, little worn, suitable for main tracks.

No. 2. Rail with a full head but with battered ends, which should be sawed for use in main tracks.

No. 3. Curve worn rail not good enough for main tracks but suitable for important passing tracks.

No. 4. Curve worn rail, not suitable for passing tracks, to be used for business or temporary tracks.

No. 5. Scrap.

While this may seem an expensive way to handle the rail it is cheaper in many cases than to wait for it to be inspected on the ground where it has been released, especially on lines when there is heavy traffic and the rail is called for on short notice.

Protection of Water Mains Under Tracks

What special precautions should be taken where water mains are laid under tracks carrying heavy traffic?

Various Conditions Will Govern

By J. D. KEILEY

Supervisor, Chesapeake & Ohio, Russell, Ky.

In laying water mains under tracks carrying heavy traffic the precautions to be taken are dependent on the depth of the line under the track, the size of the line and the character of the ground it is laid in. Where the ground is very unstable and the pipe is large it should be laid in a reinforced concrete tunnel or a larger protecting pipe. If the ground or fill is soft a mat of old ties should be made and the pipe laid on top of the mat. Where the pipe is not large and must be laid comparatively near the bottom of the ties a good expedient is to put crib work over the pipe so as to transfer the pressure to either side of the pipe instead of on it. In all cases the pipe joints should be well made so that there will be no chance of faulty workmanship causing the pipe to leak. Wherever possible, track joints immediately over the pipe should be avoided.

A Study Must Be Made of Each Case

By W. B. MCCAULEY

Engineer of Water Service, Pennsylvania, Philadelphia, Pa.

The question may be discussed under two different headings, both of which are important. From the standpoint of the railroad, subsequent failures of the pipe line might be disastrous, and they are certainly undesirable. From the standpoint of the water company, failures of the pipe line are expensive to repair and may seriously interfere with their service. Speaking as one interested in both water companies and in the operation of the railroad, the writer must confess that past experience does not indicate the necessity or desirability of any hard and fast rules. It would seem that each condition should be studied.

Under certain soil conditions, no water pipe should be permitted under the main tracks unless it is protected by an outside pipe or protecting sheath. This refers particularly to water mains laid in fills or swampy ground. Under no conditions should water main crossings be permitted unless the covering between the top of the pipe and the top of rail is at least five feet, unless the water main is protected by an outside pipe or sheath. Care should be taken to insure that the water main has ample strength for

all heads to which it might be subjected. Recent reports indicate that under some conditions Leadite gives better results than lead in making the joints in water mains under track crossings subjected to vibration. The studies, however, are not yet conclusive, in the opinion of the writer. Where outside pipe are used for sheaths, they should be well drained at either end in order to permit proper functioning, i. e. to drain away the water resulting from a leaky joint or a burst pipe. From a water company standpoint, they should be large enough to permit maintenance of the water main. The latter requirement obviously necessitates a large, expensive structure.

Manganese Switch Points for Main Tracks

Are manganese switch points safe and otherwise satisfactory for use in main lines handling fast and heavy traffic?

Manganese Switch Points Were Formerly Used and Gave Good Service

By W. E. BROWN

Assistant Chief Engineer Maintenance of Way, Pennsylvania, Pittsburgh, Pa.

About 15 years ago manganese switch points were used extensively on the western portion of our lines and found satisfactory where traffic was heavy and ordinary switch points were frequently renewed. At that time the price of manganese points was about three times that of ordinary points.

For several years we have increased the service life of main track and hard service siding switch points by recessing the stock rails with milling machines, and during the past three years have been using switch point protectors quite extensively in side track service.

They Are Not Wholly Satisfactory for Heavy Traffic

By G. J. SLIBECK

Chief Engineer, Pettibone Mulliken Company, Chicago

The use of manganese points has decreased materially in the last five years. Speaking for the roads with whom we do business, I will say none of the western lines and only one of the eastern lines uses them in main line switches.

The weakness of the manganese point is in its attachment to the open hearth point. The open hearth point has to be machined and cut and the manganese point attached thereto by means of a strap and rivets. These rivets get loose and then the point becomes unsatisfactory. Also, the open hearth rail will mash and run on the side of the head against which the manganese point must fit, and without a proper backing for the point in the mashed and over-flowed stock rail a great deal of chipping and breaking will occur on the manganese point. I do not think that they should be used in main line service under heavy traffic.

They Have Proved Satisfactory

By I. H. SCHRAM

District Engineer Maintenance of Way, Erie, Hornell, N. Y.

When manganese tip switch points first were placed on the market there was considerable trouble with them. This was due largely to faulty construction and the method of attaching the manganese tip

to the point rail. This trouble has been eliminated by the manufacturers and with suitable precautions, manganese points can be and are used in fast and heavy traffic districts. They are valuable for the deflecting point of the split switch, as, for instance the left hand point at the entering switch of a passing track on double track. It is desirable at all times to have a rail of full section for the point to set against so that the switch point will not project above the stock rail since this causes the thin manganese edge to break off.

There are places where the use of manganese tip points is unnecessary. Movable point crossing frogs in connection with slip switches or otherwise need not have manganese tip points, since the points are well protected in such cases.

Special Tools for Frog and Switch Work

Should a separate kit of tools be furnished section gangs for use in repairing or installing frogs and switches; if so, what tools should be provided?

Special Tools Are Not Needed

By J. D. KEILEY

Supervisor, Chesapeake & Ohio, Russell, Ky.

No special kit of tools need be furnished section gangs for repairing or installing frogs or switches, since this will entail a heavy expenditure in money for extra tools for which there will be no justification from the results to be obtained. In installing a frog or switch practically the same tools are used as for other track work, with the exception of a monkey wrench, cold chisels and "tommy" bars for use in handling cotter keys, a spike puller and a ball peen hammer. While these tools are used more frequently around frog and switch work, they should be in every section force's complement of tools at all times. In frog and switch work around busy yards or terminals an oxy-acetylene torch is a time and money saver.

Where switch work is being done around an interlocked switch a signal maintainer should always be present and he should see that a V-shaped wooden wedge is driven between the switch point and the stock rail to prevent the switch being thrown accidentally and injuring some one working around the switch.

Special Wrenches Are the Only Tools Needed Aside From the Regular Outfit

By A. E. PREBLE

Supervisor, Pennsylvania, Middletown, Pa.

A separate kit of tools for installing and repairing frogs and switches is unnecessary. The standard tools used in track work are sufficient for this kind of work, except special wrenches for tightening frog bolts. The work of installing frogs and switches may be classified as specialized track work, but the tools are not necessarily special.

If any minor part of a frog or switch breaks, such as a hold-down box on a spring frog or a lug on a switch point, it can be welded in the track. When renewing turnouts and crossovers of the same weight of rail or heavier material, careful planning is essential and necessary preparation must be given before actual installation, but in the replacements of either the frog or point, the methods are simplified. Each

section gang should have a standard set of tools, which standard set comprehends all tools required for general track work, including frogs and switches. The tools being at a foreman's disposal, then all that is required is a conscientious co-ordination of hand and mind, eight hours a day.

The Regular Tools Should be Sufficient

By E. D. SWIFT

Engineer Maintenance of Way, Belt Railway of Chicago

With the single exception of wrenches, there should be no need for tools for frog and switch installation and maintenance that are not necessary for other track work. It is customary to use bolts of larger diameter in frogs and in guard rails and bolts of smaller diameter in switch point connections, switch stands, target fastenings, etc., than are used in splice bars, and of necessity wrenches to fit all bolts in use must be available. Track wrenches should be furnished for the larger bolts, but the smaller bolts can be handled with the one or two monkey wrenches that must be provided in any complete set of track tools.

The relatively high cost of switch materials, considerations of safety, or certain other local conditions may frequently justify a higher standard of maintenance for switches than for adjoining unbroken track, but there is nothing in such conditions that would necessarily create a need for tools of special character or quality.

A Suggested List of Small Tools for Switch Work

By P. J. McANDREWS

Roadmaster, Chicago & North Western, Sterling, Ill.

It is economical to furnish section gangs with a kit of suitable small tools for adjusting or replacing switches or switch fittings such as rods, clips, etc. A minimum list of such tools should include:

- 1 cotter pin extractor.
- 1 light hand hammer.
- 1 6-in. cold chisel.
- 2 S-wrenches with jaws to fit clip bolts and rod bolts.
- 1 12-in. monkey wrench.
- 1 frog wrench.

As standards vary on different railroads, the kit of tools must be varied to suit the need for handy light tools to remove or attach switch rods to switch points and perform all the work of setting up and adjusting switches with a minimum of time and labor. The old-fashioned way of removing cotter pins by using a track spike as a chisel in the eye of the pin and striking the spike with a broken down monkey wrench is slow and wasteful. The small tools listed above with any additional tools called for by local conditions should be kept in a small box when not in use.

Removing Water from Scale Pits

What is the best method of removing water from scale pits or similar pits where the cost of a drainage line would be prohibitive?

Automatic Devices May be Used to Advantage

By C. J. GEYER

Engineer Maintenance of Way, Chesapeake & Ohio, Richmond, Va.

The best and most economical method of removing water from scale pits or similar pits where the cost of a drainage line is prohibitive is by the use

of automatic devices, such as electric bilge pumps or cellar drainer ejectors. An electric bilge pump is necessary where there is an unusual amount of water, but a cellar drainer will take care of drainage water in practically all ordinary cases.

In using the cellar drainer a sump should be constructed in the bottom of the pit 2 ft. by 2½ ft. and 2 ft. in depth. The drainer is placed in the sump and a float connected with an operating valve so that when the water reaches a certain height in the sump the valve is opened and the water is automatically pumped out. The cellar drainer with a 1-in. connection with the water service line and a 1½-in. discharge line is capable of handling 300 gal. of water per hour.

An Unexpected Way May be Found Sometimes

By DIVISION ENGINEER

Where electric current is available scale pits and similar pits may be drained by building a sump in the foundation and installing a small electric pump with automatic control, but in the absence of electric or other power it becomes necessary to resort to other methods. In such cases it is often satisfactory to put in a drainage line to carry the water to a conveniently located sump equipped with a hand pump to be operated by a section man or other employee at frequent enough intervals to prevent the water flooding the pit. Since the amount of water from scale pits is usually small this method does not entail much extra labor.

Unexpected ways are sometimes found out of such difficulties. The writer was once confronted with this problem and the solution was found in an abandoned mine shaft about 300 ft. from the scale pit, the owner allowing the drainage to be discharged into it for a nominal consideration.

Cinder Concrete—A Further Answer to an Earlier Question

For what purposes can cinder concrete be used with economy and safety?

It Can Be Used to Advantage in Many Places Where Strength is not Required

By A. C. IRWIN

Manager Railway Bureau, Portland Cement Association, Chicago

While the use of cinder concrete dates back to some of the earliest uses of concrete in building construction, its use in connection with railroad structures cannot be said to occupy any important position among construction materials. Here and there a small railroad building of cinder concrete block has been constructed and a number of railroad office buildings have cinder concrete filling between floor beams. However, very little progress has been made in the adoption of cinder block in the multitude of ways in which it could be used to advantage by railroad companies.

It is no criticism of railway engineers and architects that they desire to be assured of the ability of any material to perform the work imposed upon it. In fact, this is one of their many virtues. Cinder block cannot be said to rank in strength quality with well-made concrete employing the usual high grade aggregates. Moreover, the use of cinder concrete block by the railways has been retarded by the tra-

ditional reluctance of railway companies to use a patented product of this sort. A considerable percentage of concrete products used by railway companies is manufactured in their own products plants and in more than one case the manufacture of cinder concrete blocks has been dropped as soon as the patent situation was learned.

Preventing Segregation of Coarse Aggregate for Concrete

In unloading crushed stone or gravel for concrete what precautions, if any, should be taken to prevent the segregation of the larger particles?

Unload in Even Layers Instead of Dumping Progressively on a Small Pile

By J. B. HUNLEY

Engineer of Bridges and Structures, Cleveland, Cincinnati, Chicago & St. Louis, Cincinnati, Ohio

Concrete aggregates, especially the coarse ones should be handled as well as unloaded so as to prevent segregation between the fine and coarse particles to as great an extent as is possible. The greatest segregation occurs when the stock pile is large and high and in such cases, where the material is handled by a clam shell, the best method seems to be to store it in thin layers over the entire base of the pile rather than to start with a small pile and heap it up. The principal objective should be to prevent, as much as possible, the material rolling or falling any great distance when it is stored or handled.

This Can Usually Be Minimized by Care in Unloading

By BRIDGE ENGINEER

Since the proper proportioning of the fine and coarse aggregates may double the strength of concrete it is important to prevent to the greatest possible extent segregation of the larger particles of the stone or gravel when this material is unloaded. When the material is unloaded by building up a high conical pile with a clam shell there is a tendency for the larger particles to roll down to the edge of the pile, with the result either that considerable work must be done to secure a proper proportion of the large and small particles, or that the material is used without such proportioning, resulting in inferior concrete.

Where the materials are unloaded by shoveling out of cars this segregation can be limited by a little leveling off of the material as it is unloaded, since there is little segregation when the piles are small. Where a clam shell is used the segregation can be kept at a minimum by unloading over the whole area to be occupied by the stock pile and continuing this process as the pile is built up.

SOME OTHER ITEMS OF EXPENSE.—Stationery and printing cost the Missouri Pacific \$815,669 in 1926, according to figures compiled by J. T. Van Horn, stationer of that company. Pins and other types of paper fasteners to the number of 19,831,000 were used, at a total cost of \$3,925.80. The consumption of typewriter carbon sheets was 3,670,500, costing \$20,297, and 20,725,000 second sheets were used, 17,300,000 of these being letter size and the remainder note size, at a total cost of \$11,418.50.

Getting the Manufacturers' Help

New and Improved Devices That Save Labor



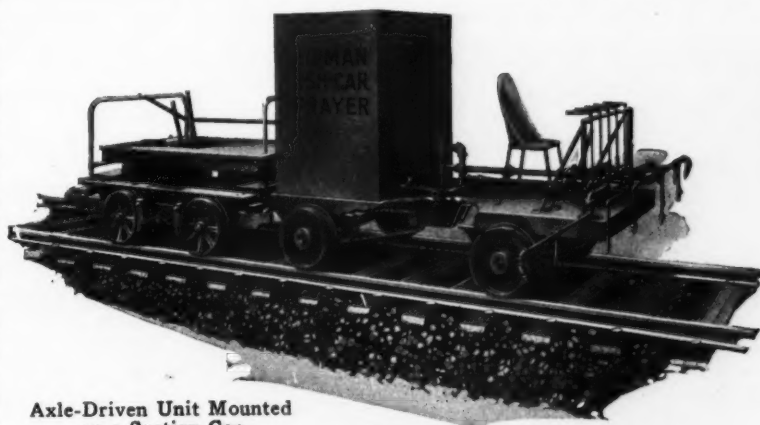
Automatic Control for Chemical Weed Killers

CHEMICAL weed killers have been successful but at the same time have required expert attention in their application to give uniform results due to methods of control which have hitherto been in use and the impossibility of driving a locomotive at a uniform speed under all conditions. The discharge of the chemical through the spray apparatus has been governed by air pressure, which method is not sufficiently flexible to compensate quickly for changes of speed, with the result that too much or too little chemical was applied before the discharge could be regulated properly.

The Chipman Chemical Engineering Company, Bound Brook, N. J., has now developed an axle-gear driven pump-driven spray which will vary the discharge of the chemical in accordance with the speed of the train and in which the pump curve has been designed to suit the axle-driven apparatus. Another problem, allied with this, has been worked out to eliminate the variation of pressure which occurs when some of the sectional sprays are turned off or on. Under the former arrangement it was found that when 50 per cent of the spray nozzles were cut off the pressure increased at the other nozzles, thereby discharging an excess of chemical through the nozzles that were left open. This has been overcome by using a three-way cock to control the nozzles, so that when any section is turned off the chemical passes through a bleeder which returns the discharge to the suction side of the pump.

Another improvement made in the method of application is a duplex arrangement whereby the Atlas non-poisonous weed killer and the standard Atlas "A", or arsenical solution may be used in the same train and controlled by the operator through a three-way cock, a turn of a valve supplying either chemical, as desired. Under certain market conditions the arsenical solution is cheaper and hence is to be preferred where ordinary types of vegetation are encountered and it is not necessary to guard against

the hazard of poisoning cattle. On the other hand the non-poisonous solution is said to be more effective in killing horsetail, and Johnson, Bermuda and certain other grasses, and can be used through station grounds and other places where cattle may have access to the right-of-way. With the duplex arrange-



Axle-Driven Unit Mounted
on a Section Car



Hand Pump and Barrel Unit for Push Cars

ment the change from one solution to the other can be made instantaneously as occasion dictates.

A small but complete axle-driven pump unit, embodying all of these improvements, has been provided to be mounted on a section push car and propelled by a section motor car. It is arranged to operate at from 5 to 10 miles an hour and is adapted for use

in yards or other places where the use of a train is unnecessary or undesirable, only two men being required for its operation. Another small unit, consisting of a hand pump and barrel mounted on skids, is furnished for applying the chemical to isolated patches of weeds along the track, or on the right-of-way within 50 ft. of the track. The unit can be placed on a push car and a hose is furnished which provides an operating radius of 100 ft. This outfit, like the axle-driven unit for push cars, can be operated by two men.

A Self-Propelled Weed Burner

THE Fairmont Railway Motors, Inc., Fairmont, Minn., has placed on the market a weed burner mounted complete on a self-propelled four-wheel car body, the frame of which is built up of 6-in. channels and I-beams and covered with a ¼-in. steel deck. The weed burners are made in two models, one with four burner nozzles, which will burn a width of 12 ft. and the other equipped with an additional nozzle on each side, together with folding extension wings, providing an effective burning width of 16 ft.

The burner oven, made of interlocking cast iron plates to resist the heat, is 8 ft. long by 9 ft. wide,



The Fairmont Weed Burner

and overhangs the rear end of the car, so that the wheels, axles and bearings are not in the flames. A heat shield of corrugated iron extends across the rear end of the car above the burners to deflect radiated heat away from the machine. The extension wings are counter-balanced and may be raised easily to clear bridges or other obstructions.

The car is equipped with two Red Seal Continental, 4-cylinder H9 industrial motors, each of 20-hp. capacity at 1,200 r.p.m., one of the motors driving the blower which supplies the air for atomizing the oil at the burners, while the other propels the car. A fuel pump, driven directly from the blower shaft, maintains a steady pressure in the oil line which feeds the burners. Two oil tanks with a total capacity of 950 gal. are located at the forward end of the car, this capacity being sufficient to burn about 38 miles of track with one filling. A pump with a capacity of 50 gal. per min. is provided for filling the oil tanks from tank cars, the pump being driven by the blower engine which is so arranged that it can be thrown out of gear with the blower while it is operating the pump.

Transmission from the propelling engine is through a multi-plate, dry-disc clutch to a 20-B Brown-Lipe three-speed unit power transmission coupled to a Fairmont ball and roller bearing reverse gear, run-

ning in oil, a thermoid disc coupling being used between the transmission and the reverse box to cushion the power impulses. The transmission provides a range of from 3 to 20 miles an hour, a governor preventing the latter rate being exceeded. The engine is water-cooled by a radiator supplied by a spiral-gear driven centrifugal pump and by a self-adjusting ball bearing fan with an automatic device which maintains correct belt tension at all times. The oiling system has a pressure feed supplied by a gear type oil pump. A seat, 5 ft. 4 in. long, for the driver and the pilot or conductor, is located near the forward end, high enough to provide a clear view in both directions along the track. Only two men are required for the operation of the car, the driver, and an operator stationed on the deck.

The oil burner will handle a wide range of oils, and gas oil, furnace oil, distillate or kerosene may be used. Any oil which will flow through a ½-in. pipe at the temperature of the air in which the machine is working is satisfactory but experience indicates that a distillate with a specific gravity of from 35 to 39 Beaume gives the best results, since it burns clean and leaves no unconsumed carbon on the track. The burners ignite instantly without generating and the flames can be started or stopped at will when passing over wooden bridges or bare spots in the track, thus saving oil. Burning speeds vary from 3 to 10 miles an hour, depending on the character and density of the vegetation. Little trouble is experienced with fires caused by the flames and two section men following the machine are said to be able to put out any fires that may be started. With fuel oil at 6½ cents a gallon, gasoline at 21 cents a gallon, and using a conductor or pilot, the average cost of operation is said to be approximately \$4.15 per mile for the four-burner machines.

A New Center-Load Light Inspection Car

MUDGE & CO., Chicago, has developed and placed on the market a one-man center-load inspection motor car which is designated as its Class C-1 "Centerlight" car, which embodies a new air-cooled engine and various other improvements which have been designed to eliminate cooling troubles and to afford ease of control and maintenance. The car can be handled easily by one man and is at the same time sturdy enough to carry two men.

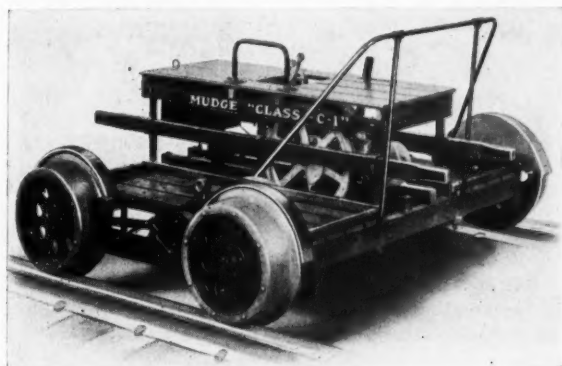
A single-cylinder, air-cooled, two-cycle engine of three horsepower is used. In this engine the cooling fins run lengthwise of the cylinder, thereby allowing uniform and unimpeded flow of air over all parts of the cylinder. The fins are of thin sheet steel and are cast in position so that they become, in effect, an integral part of the cylinder casting. The use of sheet steel for this purpose permits the use of more fins, each of greater area and of thinner section that would be possible with cast iron, thus greatly increasing the effective cooling area, which on this engine totals 528 sq. in.

The engine has a heat-treated alloy steel crankshaft mounted on heavy-duty roller bearings, bronze backed, babbitt-lined connecting rod bearings with shim adjustments and a four-ring piston fitted with a new type of deflector to reduce heating and increase efficiency.

The controls are centralized and conveniently located and the seat top can be tilted to permit com-

plete access to the engine, transmission and driving chains. A positive neutral lock is fitted to the multiple disc clutch and a ratchet lock is provided for the brake lever so that the brakes may be kept set to hold the car on a grade without blocking the wheels. The brakes are fitted with a simple equalizing toggle to assure equal pressure to both shoes under all conditions, thus preventing excessive wear on one shoe, or throwing the brake out of commission in case of an obstruction between one brake shoe and the wheel.

Self-insulated wood-center wheels are used, avoiding the necessity of fibre bushings for insulation and the axles are of cold drawn steel, carried on Mudge-Bower roller bearings running in hardened races designed to take both load and thrust. An Alemite



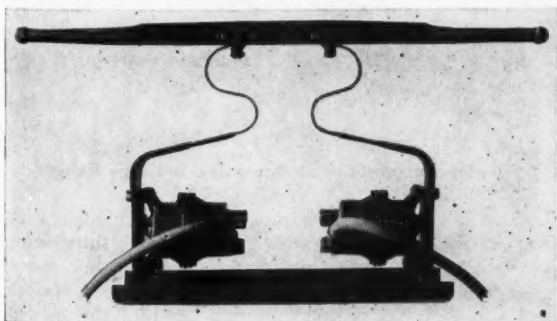
The Mudge Centerlight Inspection Car

high pressure greasing system is provided for the axle bearings. Pressed steel flange fenders are fitted over the wheels, both as a safety measure and to protect the operator from water and dirt picked up by the wheels in wet weather.

The lower edges of the longitudinal sills are shod with angle iron, and this, together with the balancing of the load, which reduces the lifting weight of one end to 114 lb. permits the easy handling of the car when it is set on or off the track.

An Electric Tampler for Bituminous Macadam Crossings

THE extensive use of rock asphalt or other bituminous macadams for highway crossings has led to a study of the best method of applying the materials since the degree to which the asphaltic composition is tamped or compacted has a direct bearing on the life of the crossing. The Cleveland,



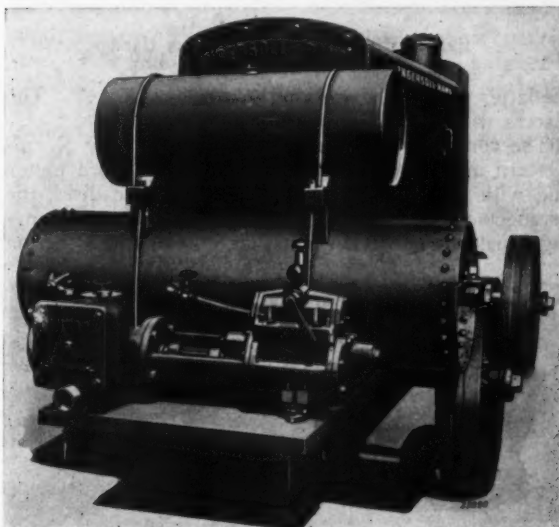
An Electric Tamping Device for Bituminous Macadam Crossings

Cincinnati, Chicago & St. Louis, which uses such crossings extensively and which also uses Jackson electric tie tampers, has devised a tamping tool for compacting the ballast between the ties to provide a solid foundation prior to the application of the asphaltic material and then to compact the crossing material after it has been spread over the surface of the track. The use of this device is said to have shown marked economy in labor and to form a smooth, uniform and durable crossing.

The device consists of an 8-in. steel channel 30 in. long to which two electric tampers are bolted, as shown in the accompanying illustration. The tampers are attached to a special handle bar which extends beyond each tamper and permits the device to be handled easily by two men. The tamping is said to be especially effective, due to the rapidity with which the blows are struck, the motors delivering 3,600 strokes per minute.

A Portable Combined Air Compressor and Water Pump

A COMBINED portable air compressor and water pump has been developed and placed on the market by the Ingersoll-Rand Company, New York, which is particularly suitable for construction jobs requiring the use of both compressed air and pumping, such as de-watering trenches or other excavations, cement gun service or furnishing water for



The Ingersoll-Rand Portable Compressor with Water Pump Attached

concrete mixers, thereby dispensing with a separate piece of machinery with an independent prime mover for such work.

The outfit consists of a standard Type Twenty gasoline-engine-driven portable air compressor with a Cameron air-driven pump mounted on the frame of the compressor adjacent to the reservoir which is its source of power. The pump is positive in action, starting as soon as the air is admitted, and can be regulated to any desired capacity within its maximum rating by adjusting the amount of air admitted to its cylinder. The pump requires no priming and will handle muddy water. The portable compressor, in addition to supplying air to the pump, will run such air tools as "Jackhammer" rock drills, riveters, clay diggers, portable hoists and

other tools commonly used in modern construction.

This combined outfit may be furnished in several sizes, or the pump may be furnished alone, together with all parts necessary for attaching it to any Ingersoll-Rand portable compressor.

The Casey Jones Ballast Discer

THE Northwestern Motor Company, Eau Claire, Wis., has placed on the market a discer for the eradication of weeds from the shoulders of the ballast which at the same time loosens the ballast to improve the drainage and shapes up the shoulder. This discer has demonstrated its efficiency in service and, among other roads, is said to have shown a saving of at least 60 per cent as compared with hand labor on the Chicago & North Western, where six machines were used during



Before the Ballast Discer Was Used

the latter part of the working season of last year. The discers will operate in any kind of ballast.

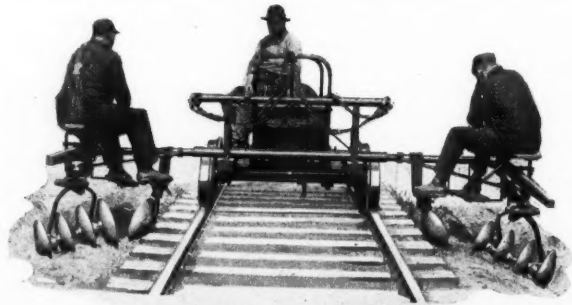
The complete outfit consists of a heavy duty Northwestern motor car with a standard 20 hp. Ford motor and with an arm on each side carrying the discs, the arrangement being as shown in one of the accompanying illustrations. Each arm has a seat for a section



The Same Track After the Discer Had Passed

man to afford the necessary weight to force the discs into the ballast to a depth of five or six inches, safety hand rails being provided to avoid danger of the riders being dismounted. The discer is designed to afford great flexibility and will operate to a maximum width of 18 ft. and to a minimum of 12 ft. A disc at the outer end on each side cuts into the sod and establishes a uniform grass line. Another disc cuts deeply into the ballast at the end of the tie, thus thoroughly loosening the ballast on the entire shoulder. By setting the discs as shown in the illustrations the ballast is thrown up on the shoulder, thus filling it out when it is slack.

By reversing the discs surplus ballast can be removed from the shoulder, or a large part of the shoulder may be removed expeditiously and cheaply in case it is desired. The amount of ballast thrown up or removed can be regulated by changing the speed of travel, the motor having power enough to provide a considerable range in speed while discing. Lifting levers are pro-



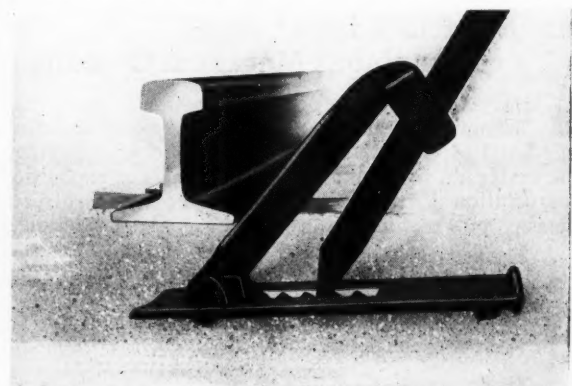
The Casey Jones Weed Discer in Operation

vided so that either or both arms may be raised to clear switch leads, cattle guards, road crossings or other obstructions. When not engaged in discing ballast the motor car may be used to operate a weed mower, to haul trailers for the transportation of large gangs or the distribution of materials or for any of the numerous tasks for which heavy duty cars are adapted.

The Hackmann Track Shifting Liner

THE Hackmann Railway Supply Company, Chicago, has placed on the market a new liner for use where tracks are to be shifted considerable distances and where it is not so important to preserve the surface as where tracks are simply being relined. The new shifting liner is of the lifting type, this feature being an advantage for the class of work for which it is intended, since it lifts the track from its bed of ballast and also permits a greater throwing range.

The liner is made of cast steel and has only two parts, the base and the lever. The lever arm is pro-



The Hackmann Shifting Liner Has a Large Range

vided with trunnions at its lower end which fit against steel bearings cast integrally with the base, thus doing away with bolts, cotter pins, washers and other parts, to become loose or out of order. The upper end of the lever arm has a socket which permits the use of a lining bar as a lever and the base is provided with notches into which the point of the bar is inserted to

secure a firm leverage and to afford the opportunity of regulating the amount of the throw, and permitting the maximum throw without resetting the base. The device is adapted for throwing skeleton track and by removing the lever arm the base may be left in place for the passage of a train.

The Improved Elastite Highway Crossing

AN important change has been made in the design of the Elastite preformed highway crossing by The Philip Carey Company, Cincinnati, Ohio, which permits the track to be tamped, joint bolts to be tightened or changed, or the rail to be relaid without the necessity of removing the entire crossing. The change



A Partially Completed Elastite Crossing Showing Method of Construction

involves the use of longitudinal slabs seven inches wide along the rail filler sections. These slabs, which are 2 in. thick, the same as the transverse slabs composing the rest of the crossing, are spiked to the furring with 20 d. spikes, thus permitting them to be easily removed, together with the filler blocks, whenever it is necessary to do any work on the track through the crossing. The Elastite slabs are made of a fibrous asphaltic composition which forms a durable, smooth surface and

which knits together under traffic in case of the scarring of the surface from derailed wheels or dragging brake beams. A recent survey of 75 of these crossings showed that no maintenance costs which could be ascribed to the failure of the crossings has been necessary since their installation.

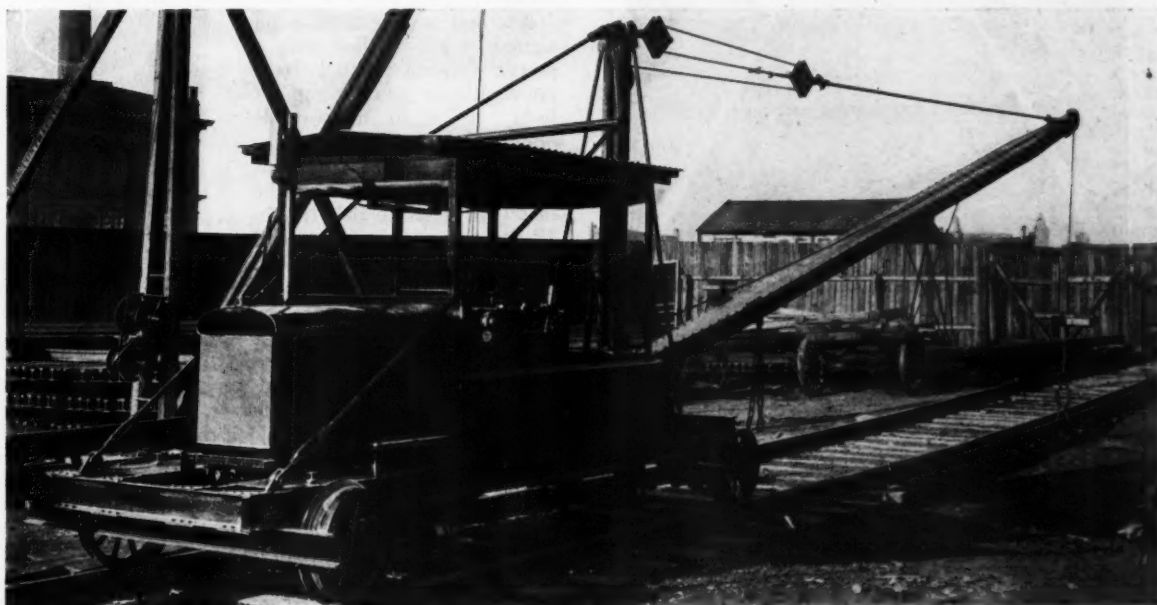
Electric-Driven Rail Layer Supplies Current for Tools

AFTER a number of years of practical service experience with a rail laying machine driven by a gasoline engine, the K. & W. Equipment Company, Chicago, has developed a new machine in which the hoist as well as the car on which the machine is mounted are driven by electric motors, the current being supplied by a gas-engine generator set. This arrangement provides a somewhat more flexible control than the old machine and makes electric power available for use in drills, grinders, rail saws and other power-driven track tools.

The machine is mounted on a four-wheel steel frame truck, one end of which is occupied by a 4-cylinder, 26-hp. Waukesha gas engine direct-connected to a General Electric 16-kw. generator delivering direct current at 125 volts. The main portion of the truck is occupied by the hoist and hoist motor and the necessary controls which are enclosed in a steel frame house with all four sides open but provided with drop curtains. The derrick mast and the traction motor are mounted over the rear axle.

Both of the motors are of General Electric make with separate full reversible five-point drum controllers. The traction motor is 10 hp., geared direct to the rear axle on a 3 to 1 ratio. This motor is capable of propelling the car with one or more trailers at from 15 to 20 miles per hour. Drum brakes are provided on both axles. The five-horsepower hoist motor is connected by means of jaw clutches to independent drums for the boom and load lines.

The boom is furnished in lengths of either 26 or 30 ft. and is constructed of structural steel of a box section with cast steel fittings. With a boom of the



The K. & W. Rail Layer Ready for Use

lengths specified, the hoist has a direct lift capacity of two tons. Provision is made for the use of rails as ballast when handling the heavier loads.

For the purpose of setting the car off the track to clear trains or when desiring to use it as a power unit for tools the machine is provided with small transverse wheels for rolling it sidewise on rails placed crosswise of the track. This operation is carried out very readily by taking a hitch on one of the rails in the track. Hauling in on the load line then causes the front wheels of the truck to be lifted off the track. Then after the transverse rails have been placed and the tension on the load line is released the truck tilts back onto the cross rails ready to be rolled to one side.

A New Rail Brace with Several Functions

THE Coover Railroad Track Brace Company, Dayton, Ohio, has placed on the market a device which combines the functions of a rail brace, a gage rod and an anti-creeper. The device consists of four universal clutches, so placed that two clutches will engage the base of each rail, with a $1\frac{1}{4}$ -in. connecting rod. Each clutch has an upper and a lower jaw, the latter having a hole which allows it to slip along the connecting rod, while the upper jaw has an oblong hole which permits it to adjust itself to the different widths and thicknesses of the flanges of different sections of rail. After the clutches have been adjusted to the proper gage they are secured



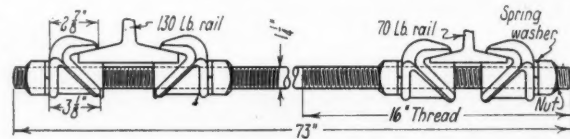
Universal Clutch Braces Used on a Sharp Curve

in place by lock nuts, one on each side of each rail, the connecting rod being threaded at each end a sufficient distance to accommodate different sections of rail and also to permit widening of the gage on curves if desired. This feature makes for economy by making it unnecessary to provide different sizes to fit the various sections of rail in use.

The action of the clutch in gripping both sides of the base of the rail not only resists the tendency of the rails to spread by crowding back the spikes on the outer side of the rail but also keeps the rail from tilting or rolling and lifting the inner spikes, which commonly occurs in the case of spreading rails. The

prevention of spreading obviates the necessity of regaging the track thus protecting the ties from spike-killing. By installing the device against the side of the tie it acts as an anti-creeper, the clutches providing the bearing surface against the tie.

The Universal brace is furnished for standard-gage running tracks and is said to fit any rail section from



Details of the Universal Clutch Brace

40 lb. to 136 lb. Braces for narrow-gage and industrial tracks are furnished with a $\frac{3}{4}$ -in. connecting rod and will fit all rail sections from 16 lb. to 70 lb. Insulated braces may be furnished for use on main tracks where track circuits are employed, but unless these are specified non-insulated braces are furnished.

A Self Boring Screw Spike

THE Malleable Screw Products Company, Cincinnati, Ohio, has recently placed on the market a screw spike for which it is unnecessary to first bore a hole in the tie for installation. The spike is made of malleable iron of not less than 51,000 lb. tensile strength and is rust-resisting. Another feature of marked difference from earlier models is found in the special design of cut thread which is $\frac{1}{8}$ in. deep, with an angle of 60 deg. on the under side and of 75 deg. on the upper side. The pitch is five threads to the inch, which is said to assure a greater holding power per inch of spike than other pitches.

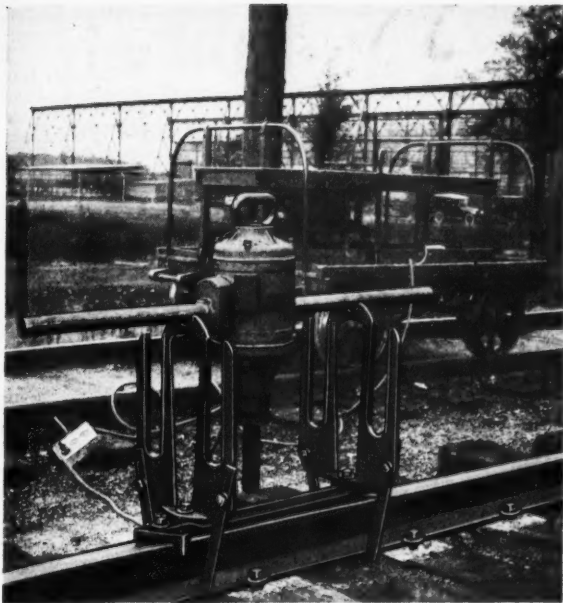
The self-boring spike is designed to be installed with a power driver operated from pneumatic or electric tamper lines, or from a portable pneumatic or electric power unit. With a power driver it is said that the spikes can be installed in white oak ties in 12 seconds and in soft wood ties in from 7 to 8 seconds.

Pneumatic driving tools using air at 50 lb. pressure, or electric drivers running at a

speed of 125 r.p.m. give the best results in driving the spikes. A rail bracket of cast steel has been designed to fit over the rail to carry the driver, and to permit its being moved easily by sliding along the rail. By the use of this bracket and driver the output per man is materially increased and the spikes are driven straight. A specially designed bracket can be furnished where it is desired to screw the tie plate to the tie. The bracket weighs about 30 lb. and can be removed quickly by lifting it straight up from the rail.

As the spike is screwed into the wood the chips are carried into the spiral flutes with which the spike is



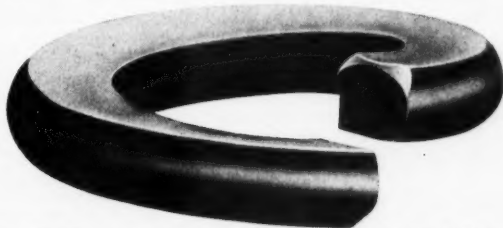


An Electric Driver Mounted on Bracket for Installing Screw Spikes

provided and are said to be compressed so that in case of the shrinking of the tie the chips will expand, thus holding the spike securely at all times.

A Spring Washer with Deflected Ends

THE Reliance Manufacturing Company, Massillon, Ohio, has changed the design of its Hy-Crome spring washer by eliminating the cutting edges at each end of the spring, thereby reducing the labor necessary to remove the nuts from track bolts in changing rails or joints. It is said that this change in the design of the washer, which allows the track man to back off the nut with the least possible exer-



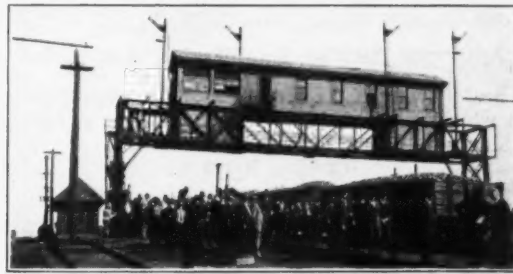
A Hy-Crome Spring Washer With Deflected Ends

tion, saves from three to five minutes in replacing a fully-bolted rail joint.

The Hy-Crome washers are designed to furnish spring action sufficient to hold the joints tightly without cutting edges and it is claimed that the deflected edges prevent the possibility of the washers being sprung beyond their original inside diameter and also prevent damage to the inner face or threads of the nut or the inner face of the joint bar. These washers, when compressed, present a tight flat surface against the nut and plate and thereby prevent the entrance of water to set up corrosion.

A SERVICE RECORD.—Eugene Greenwald, chief bridge erector of the Chicago, Milwaukee & St. Paul, has retired from active duty after 45 years of service on that road, with the remarkable record of never having lost a man by accidental death.

With the Associations



Maintenance of Way Club of Chicago

The next meeting of the Maintenance of Way Club of Chicago will be held on March 17, when O. F. Harting, assistant chief engineer of the Terminal Railroad Association of St. Louis, will present a paper on the development of foundations for railroad crossings.

The Roadmasters' Association

A meeting of the executive committee will be held at the Auditorium Hotel, Chicago, at 9 a. m. on Monday, March 7, to consider the work of the association and to receive reports of committees. The meeting was called on this date to enable the members also to visit the exhibit of the National Railway Appliances Association which will open at the Coliseum on that date.

The Hotel Statler has been selected as the headquarters for the next convention, which will be held in Buffalo, N. Y., on September 20-22.

The following members have been selected for service on committees to study and report at the next convention:

The Rearrangement of Track Work to Promote Uniform Forces Throughout the Year: E. E. Crowley, chairman, roadmaster, D. & H., Oneonta, N. Y.; C. W. Coil, vice-chairman, roadmaster, N. P., Helena, Mont.; O. V. Parsons, assistant engineer, N. & W., Roanoke, Va.; M. J. Cooney, track supervisor, Erie, Salamanca, N. Y.; F. R. Rex, supervisor, Penna., Alliance, Ohio; R. J. Yost, roadmaster, A. T. & S. F., Chillicothe, Ill.; and P. J. Hurlie, track supervisor, N. Y., N. H. & H., Danbury, Conn.

The Collection and Use of Cost Data: J. D. Keiley, chairman, supervisor of track, C. & O., Russell, Ky.; G. T. Anderson, vice-chairman, roadmaster, K. C. S., Heavener, Okla.; F. W. Easton, roadmaster, S. P., Ogden, Utah; R. H. Orwig, supervisor, Penna., Parkton, Md.; F. J. Meyer, assistant engineer, N. Y., O. & W., Middletown, N. Y.; D. V. O'Connell, roadmaster, C. & N. W., Mayfair, Ill.; W. H. Sparks, general inspector of track, C. & O., Russell, Ky.; and C. H. R. Howe, cost engineer, C. & O., Richmond, Va.

The Training of Track Men as a Means of Preventing Accidents: G. H. Warfel, chairman, assistant to general manager, U. P., Omaha, Neb.; J. H. Dooling, vice-chairman, assistant track supervisor, B. & M., Waltham, Mass.; E. C. Buhner, supervisor, N. Y. C., Kenton, Ohio; William Lawrence, supervisor, C. & E. I., Dolton, Ill.; F. H. Masters, assistant chief engineer, E. J. & E., Joliet, Ill.; J. M. Tuten, general roadmaster, A. C. L., Savannah, Ga.; and C. E. Doty, supervisor of track, N. Y. C., New York City.

The Track Department's Share in the Reduction of Stocks of Materials: W. A. Davidson, chairman, roadmaster, U. P., Kearney, Neb.; M. Donahoe, vice-chairman, general supervisor maintenance, C. & A., Chicago; B. E. Haley, general roadmaster, A. C. L., Lakeland, Fla.; K. M. Hamman, track supervisor, L. I., Jamaica, N. Y.; W. Wharry, general roadmaster, C. N., St. Thomas, Ont.; C. Feucht, roadmaster, U. P., Salina, Kan.; E. P. Safford, supervisor of track, N. Y. C., Silver Creek, N. Y.; B. Esbenson, general roadmaster, L. A. & S. L., Salt Lake City, Utah; and E. Bennetson, roadmaster, U. P., Fremont, Neb.

Means of Reducing Work Train Service: P. J. McAndrews, chairman, roadmaster, C. & N. W., Sterling, Ill.; W. A. Clark, vice-chairman, supervisor, Reading, Trenton

Junction, N. J.; A. Chinn, assistant engineer maintenance of way, C. B. & Q., Alliance, Neb.; J. M. O'Connell, track supervisor, N. Y. N. H. & H., New Haven, Conn.; G. G. Smart, general roadmaster, G. N., St. Paul, Minn.; J. J. Desmond, roadmaster, I. C., Chicago; and J. G. Hartley, division engineer, Penna., New Castle, Pa.

American Railway Engineering Association

The following is the program for the annual convention which will be held at the Palmer House, Chicago, on March 8-10.

Tuesday, March 8.

President's address.
Reports of secretary and treasurer.
Reports of standing and special committees on:
Records and Accounts
Shops and Locomotive Terminals
Ballast
Electricity
Standardization
Track
Ties
Signals and Interlocking

Wednesday, March 9.

Water Service
Grade Crossing Design, Protection and Elimination
Economics of Railway Labor
Economics of Railway Operation
Economics of Railway Location
Iron and Steel Structures
Rail
Rules and Organization
Annual Dinner

Thursday, March 10

Yards and Terminals
Buildings
Wooden Bridges and Trestles
Wood Preservation
Uniform General Contract Forms
Masonry
Roadway
Co-operative Relations with Universities
Stresses in Railroad Track
Clearances—Progress Report
New Business
Election and Installation of Officers
Adjournment

The Bridge and Building Association

The following members of the American Railway Bridge and Building Association have been appointed members of committees to report at the next annual convention in Minneapolis, Minn., next October.

Methods of Applying and Repairing Waterproofing on Concrete Structures and Those Features of Design Relating Thereto: T. H. Strate, chairman, engineer of track elevation, C. M. & St. P., Chicago; T. W. Pinard, vice-chairman, assistant chief engineering maintenance of way, Penna., Western region, Chicago; William B. Hotson, superintendent bridges and buildings, E. J. & E., Joliet, Ill.; L. B. Alexander, assistant bridge engineer, M. C., Detroit, Mich.; S. T. Corey, assistant bridge engineer, C. R. I. & P., Chicago; A. E. Bechtelheimer, general bridge inspector, C. & N. W., Chicago; Pusey Jones, bridge engineer, B. & M., East Cambridge, Mass.; and W. L. Smith, bridge and structural engineer, St. Louis, Mo.

The More Uniform Distribution of Bridge and Building Work Throughout the Year: F. P. Gutelius, Jr., chairman, division engineer, D. & H., Oneonta, N. Y.; K. Peabody, vice-chairman, general supervisor buildings, N. Y. C., New York; W. A. Clark, assistant to general manager and chief engineer, D. & I. R., Duluth, Minn.; Neal Gregory, chief carpenter, C. M. & St. P., Madison, Wis.; A. I. Gauthier, supervisor bridges and buildings, B. & M., Concord, N. H.; L. C. Smith, supervisor bridge and building department, I. H. B., Calumet City, Ill.; H. B. Stuart, valuation engineer, C. N., Toronto, Ont.; and F. O. Condon, engineer, maintenance of way, C. N., Atlantic region, Moncton, N. B.

Stock Yards Facilities and Their Maintenance: C. J. Scribner, chairman, assistant engineer of scales, C. B. & Q., Chicago; H. Heisenbuttel, vice-chairman, supervisor bridges and buildings, C. & N. W., Norfolk, Neb.; J. J. Taylor, superintendent bridges and buildings, K. C. S., Texarkana, Tex.; E. P. Hawkins, division engineer, M. P.,

Osawatomie, Kan.; A. J. James, general foreman bridges and buildings, A. T. & S. F., Topeka, Kan.; J. H. Stearns, master carpenter, C. R. I. & P., Enid, Okla.; and G. T. Ray, supervisor bridges and buildings, U. P., Marysville, Kan.

Recent Developments in Concrete Construction Practices. (a) The Application of the Water Cement Ratio and its Influence in the Determination of Concrete Proportions. (b) The Use, Advantages and Disadvantages of Quick Setting Cements and Accelerators: A. B. Scowden, chairman, assistant engineer bridges, B. & O., Western lines, Cincinnati, Ohio; F. H. Masters, vice-chairman, assistant chief engineer, E. J. & E., Joliet, Ill.; W. T. Krausch, engineer of buildings, C. B. & Q., Chicago; C. S. Heritage, bridge engineer, K. C. S., Kansas City, Mo.; J. M. Fitzgerald, office engineer, C. of G., Savannah, Ga.; N. Stadtfeld, assistant engineer, Board of Transportation, City of New York, New York; G. A. Saint, assistant engineer, C. & N. W., Chicago; F. Ringer, chief engineer, M.-K.-T., St. Louis, Mo.; and A. C. Irwin, manager, railways bureau, Portland Cement Association, Chicago.

Methods of Handling Excavation for Various Types of Foundation Work: H. I. Benjamin, chairman, assistant division engineer, S. P., Pacific lines, Portland, Ore.; R. C. Henderson, vice-chairman, master carpenter, B. & O., Dayton, Ohio; A. Montzheimer, chief engineer, E. J. & E., Joliet, Ill.; Albert Fink, general foreman, D. L. & W., Buffalo, N. Y.; and William Shively, master carpenter, C. R. R. of N. J., Jersey City, N. J.

The Relative Merits of Various Materials for Floors on Highway Bridges: John S. Ekey, chairman, supervisor of structures, B. & L. E., Greenville, Pa.; J. S. Huntoon, vice-chairman, assistant bridge engineer, M. C., Detroit, Mich.; A. B. Fink, general foreman bridges and buildings, D. L. & W., Buffalo, N. Y.; H. H. Harman, engineer of bridges, B. & L. E., Greenville, Pa.; J. D. Voorheis, supervisor bridges and buildings, Wabash, Peru, Ind.; F. W. Hillman, assistant engineer maintenance, C. & N. W., Chicago; J. W. Holcomb, supervisor bridges and buildings, L. V., Buffalo, N. Y.; J. A. Bohland, bridge engineer, G. N., St. Paul, Minn.; R. E. Sheehan, supervisor bridges, C. B. & Q., Chicago; and E. Cahill, general foreman bridges and buildings, D. L. & W., Scranton, Pa.

The Protection of Men Doing Work Under Traffic: G. S. Crites, chairman, division engineer, B. & O., Baltimore, Md.; G. A. Rodman, vice-chairman, general supervisor bridges and buildings, N. Y., N. H. & H., New Haven, Conn.; C. Gradt, chief carpenter, C. M. & St. P., Savannah, Ill.; T. B. Turnbull, superintendent bridges and buildings, A. A., Owosso, Mich.; J. A. S. Redfield, assistant engineer maintenance of way, C. & N. W., Chicago; H. J. Barkley, supervisor bridges and buildings, I. C., Carbondale, Ill.; J. E. Buckley, supervisor bridges and buildings, B. & M., Fitchburg, Mass.; and A. V. Rohweder, superintendent of safety, D. M. & N., Duluth, Minn.

The Maintenance and Operation of Water Treating Plants: C. E. Brightwell, chairman, supervisor of water supply, C. & O., Huntington, W. Va.; H. H. Richardson, vice-chairman, engineer water service, N. P., St. Louis, Mo.; L. A. Cowser, supervisor tests, B. & O., Dayton, Ohio; B. R. Kulp, division engineer, C. & N. W., Madison, Wis.; O. C. Anderson, water service foreman, S. P., San Francisco, Cal.; L. C. Prunty, general foreman water service, U. P., Kansas City, Mo.; F. M. Case, foreman water service, C. & N. W., Belle Plaine, Iowa; and C. R. Knowles, superintendent of water service, I. C., Chicago.

Directory of Associations

American Railway Bridge and Building Association.—C. A. Lichty, secretary, 319 North Waller avenue, Chicago. Next convention, October 18-20, 1927, Minneapolis, Minn.

American Railway Engineering Association (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Next convention, Palmer House, Chicago, March 8-10, 1927.

American Wood Preservers' Association.—E. J. Stocking, secretary, 111 West Washington street, Chicago. Next convention, January 24-26, 1928, Montreal, Que.

Bridge Building Supply Men's Association.—B. J. Wilson, secretary, Pocket List of Railroad Officials, 1428 Lytton Building, Chicago. Annual exhibit at convention of American Railway Bridge and Building Association.

National Association of Railroad Tie Producers.—E. A. Morse, secretary, Potosi Tie & Lumber Company, St. Louis, Mo. Next convention, Hot Springs, Ark., April, 1928.

National Railway Appliances Association.—C. W. Kelly, secretary, Seiberger Building, 845 South Wabash avenue, Chicago. Annual exhibition March 7-10 during convention of American Railway Engineering Association.

Roadmasters' and Maintenance of Way Association.—T. F. Donahoe, secretary, 428 Mansion street, Pittsburgh, Pa. Next convention, September 20-22, 1927, Buffalo, N. Y., or Chicago.

Track Supply Association.—W. C. Kidd, secretary, Ramapo-Ajax Corporation, Hillburn, N. Y. Annual Exhibit at convention of Roadmasters' and Maintenance of Way Association.

The Material Market

RAIL orders have continued to come in during the past month, in spite of the fact that the usual season for purchases is passed. The most notable of these was the Southern Pacific's purchase of 42,500 tons. Another for 15,000 tons was made by the Boston & Maine, while it is understood that the Rock Island is considering an addition to its orders for 26,000 tons by a supplemental order of 12,000 to 15,000 tons.

While track fastenings are not now moving as rapidly as was anticipated and fully half of the requirements tributary to the Chicago market are as yet unplaced, the inquiries are large and a number of orders for sizable quantities have been reported. Among tie plate orders are those of the Boston & Maine for 1,300,000, the Wheeling & Lake Erie for 100,000, and the Nickel Plate for 250,000. It is understood further that the last named road is expecting to place a second order duplicating the first one. This road has also purchased 5,500 kegs of spikes and 5,000 kegs of bolts. The Boston & Maine is in the market for 11,000 kegs of spikes and the Southern Pacific for 30,000 kegs of spikes and bolts. Orders for spikes and bolts placed at Chicago during the week ending February 12 totalled approximately 25,000 kegs.

Prices are soft. Stimulated by concessions which were made in many items of iron and steel, a renewed impetus has been given to buying but prices have continued to show weakness. This is evident from the fact that the prices of wire and wire products, for example, which were reduced in January, were again subject to reductions in February. The same is true of structural

Prices Per 100 Lb.

	January			February		
	Pittsburgh	Chicago		Pittsburgh	Chicago	
Track spikes.....	\$2.80 to \$3.00	.....	\$2.90	\$2.80 to \$3.00	.....	\$2.90
Track bolts.....	3.90 to 4.25	.....	3.90	3.90 to 4.25	.....	3.90
Angle bars.....	2.75	.....	2.75	2.75	.....	2.75
Tie plates, steel.....	2.35	.....	2.35	2.35	.....	2.35
Boat spikes.....	3.25	.....	3.25	3.25	.....	3.25
Plain Wire.....	2.45 to 2.50	\$2.50 to 2.55	.....	2.40	.....	2.45
Wire nails, keg.....	2.60 to 2.65	2.65 to 2.70	.....	2.50 to 2.55	.....	2.60
Barb wire, galv.....	3.30 to 3.35	3.35 to 3.40	.....	3.25	.....	3.30
C. I. pipe, 6 in.	.....	.....	.....	.....	.....	.....
12 in., ton.....	.....	43.70 to 45.20	.....	\$43.70 to 45.20	.....	.....
Plates.....	1.90	.....	2.10	1.80 to 1.90	2.00 to 2.10	.....
Shapes.....	1.90 to 2.00	.....	2.10	1.85 to 1.90	2.00 to 2.10	.....
Bars, soft steel.....	1.90 to 2.00	.....	2.10	1.85 to 1.90	2.00 to 2.10	.....
Rivets, struc.....	2.30 to 2.40	.....	2.60	2.30 to 2.40	.....	2.60
Conc. bars, billet.....	1.90 to 2.00	.....	.....	1.90	.....	.....
Conc. bars, rail.....	1.80 to 1.90	1.90 to 2.00	.....	1.75 to 1.80	1.90 to 2.00	.....
Rails, per gross ton, f.o.b., mills.....	.....	43.00	.....	.....	43.00	.....

plates, shapes and bars. In the case of track materials no quoted reductions are indicated but there are reports of concessions from such quotations in the case of steel tie plates.

Orders for prompt delivery are the rule. Whereas the practice of quoting two prices for any commodity was formerly done primarily to indicate the difference in price for immediate and future deliveries, the present significance of the lower figure is that of the more favorable price to the buyer in large volume.

Rail mills are now operating at about 85 per cent of capacity, general operation in the steel industry being at about 77 per cent of capacity. The unfilled orders on the books of the United Steel Corporation on January 31, 1927, totalled 3,800,177 tons, or a reduction of 160,812 tons from the total volume of unfilled orders on December 31, 1926, this being the first reduction in the monthly total since August 31, 1926.

The scrap market is slow because the users of this material are cautious about purchases of tonnages greater than are required for immediate use. As a consequence, scrap prices which advanced during January have receded almost to the levels that prevailed at the beginning of the year. Among other offerings are those of the Santa Fe of 3,000 tons, the Rock Island 3,000 tons and the Chicago & Alton 1,100 tons.

Per Gross Ton

	January	February
Relaying rails.....	\$26.00 to \$31.00	\$26.00 to \$31.00
Rails for rerolling.....	16.50 to 17.00	15.75 to 16.25
Rails less than 3 ft. long.....	17.25 to 17.75	16.50 to 17.00
Frogs and switches cut apart.....	15.00 to 15.50	14.50 to 15.00
Steel angle bars.....	16.00 to 16.50	15.25 to 15.75

Statistics compiled by the Southern Pine Manufacturers' Association show that the average volume of orders per mill for the week ending February 18, was 524,390 ft. b.m., a somewhat smaller figure than for the corresponding week in either 1926 or 1925. However, the figure quoted above represent a gradual but steady increase in the volume of business since the middle of November. There has also been an increase in the volume of unfilled orders during this same period, although the total volume of orders on hand on February 18 was not as large as at the same date last year or the year before.

West coast lumber dealers contend that prices have reached the end of their downward trend and report an increase in demand from Atlantic coast purchasers. Some of this business, however, is going at low prices, Douglas fir stringers, dense grade, being sold at \$20 where it is contended by the mills that the price ought to be \$23, and bridge ties have sold recently at \$19.

Southern Pine Mill Prices

	January	February
Flooring, 1x4, B and B, flat.....	\$43.96	\$41.67
Boards, 1x8, No. 1.....	34.90	35.58
Dimension, 2x4, 16, No. 1, common.....	26.29	23.92
Dimension, 2x10, No. 1, common.....	29.33	28.45
Dimension, 2x4, 16, No. 2, common.....	22.71	23.10
Dimension, 2x10, 16, No. 2, common.....	23.55	24.26

Douglas Fir Mill Prices

Flooring, 1x4, No. 2, clear flat.....	\$27.00	\$26.00
Boards, 1x8, 6 to 20, No. 1, common.....	16.00	16.00
Dimension, 2x4, No. 1, common.....	17.00	17.00
Dimension, 2x10, 16, No. 1, common.....	17.00	17.00
Timbers, 6x6 to 8x8, No. 1.....	20.00	20.00
Timbers, 3x12 to 12x12, rough.....	18.00	18.00

No changes have occurred in the price of Portland cement during the past month. The prices shown below are per barrel in carload lots, not including package.

New York.....	\$2.15	Minneapolis.....	\$2.22
Pittsburgh.....	2.04	Denver.....	2.85
New Orleans.....	2.40	Dallas.....	2.05
Chicago.....	2.05	San Francisco.....	2.31
Cincinnati.....	2.32	Montreal.....	1.15



On the Erie at Cocheton, N. Y.

Railway News



Briefly Told

The regulations for the transportation of explosives and other dangerous articles by freight have been revised by the Interstate Commerce Commission, which has promulgated new regulations to become effective on May 1.

The final blast which connected the headings of the pioneer bore of the Moffat tunnel, was fired by President Coolidge on February 18, the pressure on a key in Washington closing the circuit that fired the shot. While the pioneer tunnel has been holed through there remains about a mile of excavation to complete the main tunnel.

A bill to exempt short line railroads of a defined class from the recapture provisions of the Transportation act has been introduced in the House of Representatives by Representative Newton of Minnesota. It is similar to one introduced in the Senate by Senator Pittman which is being supported by the American Short Line Railroad Association.

The Supreme Court of the United States has handed down a decision holding that the final valuations of railroads made by the Interstate Commerce Commission are not reviewable by the courts until the commission makes use of them as a basis for rate making or for some other official act, at which time the railroads will have opportunity to contest the correctness of the findings of the commission.

Ezra Brainerd, a lawyer of Muskogee, Okla., has been nominated by President Coolidge as a member of the Interstate Commerce Commission to succeed Frederick J. Cox, whose term expired on December 31. Mr. Brainerd has been engaged in the practice of law at Muskogee for about 20 years and is a graduate of the University of Michigan. The Senate has confirmed the appointment of **Pat M. Neff** as a member of the United States Board of Mediation.

The Chicago, Burlington & Quincy has been authorized to abandon its Chalco-Yutan cut-off from Chalco Junction, Neb., towards Yutan, seven miles. This line was built in 1921 to provide a more direct route between Omaha and points north of Yutan, but was operated only from May 1, 1923, to January, 1924. The company has also applied for authority to abandon a narrow gage branch line in the Black Hills from Galena Junction, S. D., to Galena, 8.45 miles.

The sale of the Chicago, Milwaukee & St. Paul, which took place at Butte, Mont., on November 22, has been approved by a decree of confirmation entered in all judicial courts in which the properties are represented, thus making possible the execution of foreclosure proceedings. Because of the railroad's property holdings in 11 states, it was necessary to secure confirmation of the sale in four judicial circuits by the federal courts at Minneapolis, Minn., Great Falls, Mont., Grand Rapids, Mich., and New York.

Revenue car loadings for the week ended February 12 totaled 968,317 cars, an increase of 50,692 cars as compared with the corresponding week of 1926, and of 64,382 cars over the same period in 1925. The greater part of the increase was due to the heavy loading of coal. The cumulative total for the first seven weeks of the current year is 6,463,958 as compared with 6,260,372 and 6,386,079 for 1926 and 1925 respectively.

The Chesapeake & Ohio has asked permission of the Interstate Commerce Commission to acquire control of the Erie and the Pere Marquette by the purchase of stock. If the plan is consummated it will form a system compris-

ing approximately 7,553 miles of road (including trackage rights) in the United States and 337 miles (also including trackage rights) in Canada. Nothing is said in the application as to the New York, Chicago & St. Louis, whose application to acquire control of the C. & O., the Erie and the P. M. was refused by the commission during 1926.

The utilization of air rights over tracks operated by steam is contemplated in plans now being prepared for the erection of a large newspaper plant and office building by the Chicago Daily News. Through a combination of sale and lease the newspaper has acquired the use of an area approximately 400 ft. by 250 ft. fronting on Madison, Canal and Washington streets and the Chicago river. A large part of this area is occupied by the approach tracks and leads to the tracks of the Chicago Union Station and plans for the building, which is to be 26 stores in height, provide that smoke emitted from locomotives on these tracks is to be collected in smoke chambers and conducted through chimneys to outlets above the roof.

An American has been granted a concession for a trans-Andean railroad in Peru, according to a report to the Department of Commerce made by L. W. James, commercial attache at Lima. The road is to start from some port on the Pacific and will terminate at Yurimaguas on the Huallaga river, a tributary of the Amazon, where there is a minimum of eight feet of water, even during the dry season. The road will cross the Andes at a maximum altitude of 8,000 ft., as compared with 15,000 ft. by other routes. The concession carries with it almost 100,000 sq. mi. of land, with full title, and mining and petroleum rights. It has been estimated that the cost of construction will be about \$30,000,000.

The schedule of the activities of the Safety Section for the month of March are outlined in circular No. 143, which has been issued by L. G. Bentley, chairman of the committee on education and which deals entirely with the prompt return to duty of men who have been slightly injured. The circular says in part: The mental and physical well-being of the injured employee is of dominant importance. The sooner an injured man returns to work after he is able, the quicker will be the man's complete recovery. For an injured man to be returned to work before he is able is economically unprofitable. It jeopardizes his recovery and creates lack of confidence. "Minor injuries" run into "reportable injuries" because of lack of competent first aid and close interest of the foreman which permits the injured men to drop out of sight until they return to work.

Final valuations of 108 railroads were issued by the Interstate Commerce Commission from June 30, 1926, to December 31, bringing the total to the latter date to 410. Of these 410 reports, 299 were made final by the Commission due to carriers either failing to make a protest against the tentative valuations or to their failure to present evidence after a protest had been made. During the six-month period between June 30, 1926, and December 31, the Commission served 91 tentative valuations, bringing the total to the latter date to 931. Tentative valuations have been served on all Class I roads except seven in the Eastern group, six in the Southern group and 12 in the Western group. The total expenditure by the Bureau of Valuation to December 31 was \$28,256,027, while the carriers expended a total of \$91,755,158 on valuation work to the same date.

Personal Mention

General

Robert C. Falconer, assistant to the president and chief engineer of the Erie, with headquarters at New York, has been promoted to engineering assistant vice-president, with the same headquarters. **Robert E. Woodruff**, division superintendent, with headquarters at Buffalo, whose railway experience includes both engineering and maintenance, has been promoted to general manager of the newly created Eastern district, with jurisdiction over the lines west of Port Jervis, N. Y., and Stroudsburg, Pa., to and including Buffalo, N. Y., and Salamanca. **Carl Bucholtz**, division superintendent, with headquarters at Youngstown, Ohio, whose railway training has been largely in the maintenance of way and engineering departments, has been promoted to assistant general manager of the newly created Western district, with the same headquarters.

Mr. Falconer was born on March 21, 1874, at St. Mary's, Pa., and graduated from the University of Wisconsin in 1895. He entered railway service in 1898 as a trainsman



Robert C. Falconer

on the Pennsylvania and later was promoted to resident engineer. He was out of railway service from May 1, 1901, until October, 1905, when he became an assistant engineer in the construction department of the Erie. In 1911, he was promoted to division engineer of the New York division and in October, 1912, was further promoted to principal assistant engineer. He served as superintendent of construction from February, 1913, until January, 1916, at which time he was promoted to assistant chief engineer. In July, 1918, he was promoted to assistant to the president and chief engineer, with headquarters at New York, in which position he was serving at the time of his recent promotion to engineering assistant vice-president.

Mr. Bucholtz was born on March 21, 1883, at Baltimore, Md., and was educated at Loyola College. He entered railway service on June 6, 1902, as a special machinist apprentice at the Mt. Clare shops of the Baltimore & Ohio, and became a maintenance of way inspector on the same road in June, 1904. He was promoted to assistant engineer on the Baltimore division in March, 1906, and to assistant division engineer of the Cumberland division, with headquarters at Cumberland, Md., in August, 1907. In February, 1908, he was made supervisor of the Mountain district of the Cumberland division, with headquarters at Rowlesburg, W. Va., remaining in that position until December, 1908, when he became maintenance of way inspector on the Missouri Pacific, with headquarters at Little Rock, Ark. In June, 1910, he was promoted to division engineer of the Joplin division, with headquarters at Nevada, Mo., leaving on November 3, 1914, to enter the service of the Erie as an assistant engineer, with headquarters at Cleveland, Ohio. He was promoted to division engineer of the Meadville division, with headquarters at Meadville, Pa., on January 1, 1915, where he served until May 1, 1916, when he entered the operating department as a trainmaster. He was promoted to assistant superintendent of the Mohoning division, with headquarters at Youngstown, Ohio, on October 1, 1916, and to superin-

tendent of the same division, with the same headquarters, on November 1, 1917. He was holding the latter position at the time of his recent promotion.

Mr. Woodruff was born in 1884 at Green Bay, Wis., and was educated at Purdue University. He entered railway service in 1905 as a section laborer on the Erie and was



Robert E. Woodruff

promoted successively to track foreman, construction engineer, assistant division engineer, and division engineer at Meadville, Pa., leaving this position to enter the operating department as trainmaster. In March, 1909, he was promoted to general agent of the operating department, with headquarters at Chicago, and in November, 1910, he was promoted to superintendent at Rochester, N. Y., being transferred successively to Marion, Ohio, and Youngstown. On November 1, 1917, he was promoted to superintendent of transportation and was advanced to general superintendent of the lines west on June 15, 1918. On the establishment of the regional organization, he was promoted to manager of the Hornell region at Hornell, N. Y., and when this region was consolidated with other regions he was appointed division superintendent at Buffalo, N. Y., which position he was holding at the time of his promotion to general manager of the Eastern district.

Engineering

B. E. Widder has been appointed engineer of buildings of the Atlantic Coast Line, with headquarters at Wilmington, N. C., succeeding **A. M. Griffin**, who has resigned.

G. Murray, division engineer of the Melville division of the Saskatchewan district of the Canadian National, with headquarters at Melville, Sask., has resumed his duties following a leave of absence, replacing **A. J. Gayfer**, who has been transferred.

E. B. Fithian, assistant engineer maintenance of way of the Missouri Pacific, with headquarters at St. Louis, Mo., has been appointed division engineer of the Wichita division, with headquarters at Wichita, Kan., where he succeeds **L. Winship**, who has been appointed assistant division engineer of the Colorado division, with headquarters at Hoisington, Kan.

George D. Eddy, assistant engineer with the Presidents' Conference Committee on Federal Valuation, with headquarters at Chicago, has been appointed valuation engineer of the St. Louis-San Francisco, with headquarters at St. Louis, Mo. Mr. Eddy was born on December 11, 1871, at Hemmingford, Que., and entered railway service in June, 1897, as a rodman on the New York & Ottawa (now a part of the New York Central). In September, 1898, he became an assistant engineer on the Muscatine North & South (now the Burlington, Muscatine & Northwestern) and in March, 1899, became a rodman on the Northern Pacific, later being promoted to inspector. He entered the service of the Great Northern in January, 1900, as an assistant engineer on maintenance and dock construction, and was advanced to engineer in charge of construction in March, 1906. In 1914 he was promoted to assistant valuation engineer and this was followed by his promotion to valuation engineer in 1919. He left the Great Northern in June, 1925, to engage in special engineering work for A. Guthrie & Co., contractors, St. Paul, Minn., and in November of the same year became assistant engineer with the Presidents' Conference Committee on Fed-

eral Valuation at Chicago, which position he was holding at the time of his recent appointment as valuation engineer of the Frisco.

H. C. Mann, assistant chief engineer of the Los Angeles & Salt Lake unit of the Union Pacific system, with headquarters at Los Angeles, has been promoted to assistant chief engineer of the system, with headquarters at Omaha, a newly created position. **R. L. Adamson**, division engineer on the L. A. & S. L., with headquarters at Los Angeles, has been promoted to succeed Mr. Mann, with the same headquarters. **S. H. Osborne**, division engineer on the Union Pacific, with headquarters at Denver, Colo., has been promoted to engineer maintenance of way, with headquarters at Omaha, Neb., succeeding R. B. Robinson, deceased.

Mr. Mann was born on August 30, 1885, at Missouri Valley, Iowa, and graduated from the University of Nebraska. He entered railway service in August, 1908, as a rodman on the Canadian Pacific and in 1909 became an instrumentman on the Union Pacific, serving in that capacity and as assistant engineer on second track work in Nebraska and Wyoming until January, 1912, when he entered the valuation department, with headquarters at Omaha, Neb. From October, 1912, to October, 1918, he was assistant engineer on branch line and second track construction in Utah and Wyoming. He was appointed engineer accountant at Omaha in September, 1919, and remained in that position until April, 1922, when he was placed in charge of the construction of the Columbia River bridge. Following this he was in charge of the construction of tourist facilities in Southern Utah until November 15, 1924, when he was promoted to assistant engineer on the Los Angeles & Salt Lake at Los Angeles, and was again promoted to assistant chief engineer in December, 1925, which position he was holding at the time of his recent promotion to assistant chief engineer of the Union Pacific system.

Mr. Adamson entered the service of the Union Pacific in 1910 as a draftsman in the office of the chief engineer at Omaha, being promoted through various positions in that office and the valuation department from 1912 to 1915, including that of chief draftsman in the office of the bridge engineer. Following this Mr. Adamson was engineer on construction and maintenance on the Wyoming division, and later had charge of the construction of terminals at Kansas City, Mo., and Council Bluffs, Iowa, and also of bridges on the Oregon - Washington Railroad & Navigation unit of the system. In February, 1923, he was placed in charge of construction of a yard terminal in Los Angeles and in November, 1924, took charge of the construction of tourist facilities in Southern Utah, with headquarters at Cedar City. In 1925, he was promoted to division engineer on the L. A. & St. L., which position he was holding at the time of his recent promotion to assistant chief engineer.

Mr. Osborne entered railway service on the Union Pacific as a clerk on construction and later served successively as an axeman, rodman, instrumentman and assistant engineer in charge of a party on construction. He was then promoted to division engineer on the Oregon Short Line unit of the Union Pacific system, with headquarters at Pocatello, Idaho. He left railway service in 1914, but returned later as assistant engineer on the Union Pacific, being promoted in 1918 to division engineer of the Kansas

division, with headquarters at Kansas City, Mo. In 1920 he was transferred to the Nebraska division, where he served as division engineer until 1924, with the exception of a part of 1922 and 1923, when he was acting assistant superintendent on that division. In 1924, he was transferred to the Los Angeles & Salt Lake unit, with headquarters at Los Angeles, Cal., and in 1925 was transferred to the Colorado division of the Union Pacific, with headquarters at Denver, Colo., in which position he was serving at the time of his recent promotion to engineer maintenance of way.

J. T. Ridgely, supervisor on the Pennsylvania, with headquarters at Conway, Pa., has been promoted to division engineer, with headquarters at Richmond, Ind., to succeed **Simeon Hodgkin**, whose election as vice-president of the Hayes Track Appliance Company, Richmond, Ind., was noted in the February issue.

Arthur C. Watson, superintendent of the Middle division of the Pennsylvania with headquarters at Altoona, Pa., has been appointed chief engineer of the Long Island, succeeding **T. J. Skillman**, whose appointment as chief engineer of the Pennsylvania system was noted in the February issue. Mr. Watson entered railway service in 1899 as a chainman on the Erie and Ashtabula division of the Pennsylvania. After serving in this capacity for a year he left to continue his college course. During his summer vacation from June 1, 1901, to September 15 of the same year he was an assistant in the engineering corps on that division. After his graduation from Washington and Jefferson College the following spring he returned to the service of the Pennsylvania on June 1, 1902. He resigned in April, 1903, to become an assistant engineer on the Illinois Central system at Vicksburg, Miss., and remained there until April 1 of the following year when he entered the service of the Vandalia (now a part of the Pennsylvania). On July 22, 1905, he was promoted to assistant engineer on the Indianapolis Terminal and Vincennes division and was transferred successively to the Richmond, Western and C. and P. divisions. He was promoted to division engineer of the Zanesville division on January, 1913, and served in this capacity successively on the Logansport, and C. and P. divisions. On the termination of federal control on March 1, 1920, Mr. Watson was promoted to superintendent of the Richmond division and served later in the same capacity on the Schuylkill, Conemaugh and C. and P. divisions. He was transferred to the Middle division, with headquarters at Altoona, Pa., on June 1, 1926, where he was located at the time of his recent appointment as chief engineer of the Long Island.

Robert Farnham, engineer of bridges and buildings on the Pennsylvania with jurisdiction over the eastern portion of the system with headquarters at Philadelphia, Pa., has been promoted to chief engineer of the Philadelphia improvements and will have supervision over the construction of the new Philadelphia station under the direction of Elisha Lee, vice-president. **A. R. Wilson**, assistant engineer of bridges and buildings, of the Eastern region, with headquarters at Philadelphia, has been promoted to succeed Mr. Farnham. **T. P. Watson**, engineer of construction, Central region, with headquarters at Pittsburgh, Pa., has been promoted to the position of principal assistant engineer of Philadelphia improvements. **S. H. Noyes**, formerly associated with the bridge department of the



A. C. Watson



R. L. Adamson

Pennsylvania, and at present bridge engineer of the city of Philadelphia, has been appointed assistant to the chief engineer of Philadelphia improvements. In their respective positions, which have been newly created, Mr. Watson and Mr. Noyes will act as aids to Mr. Farnham.

J. L. Gressitt, whose promotion to division engineer on the Pennsylvania, with headquarters at Ft. Wayne, Ind., was noted in the February issue, was born on April 4, 1887, at Baltimore, Md., and was educated at Lehigh University. He entered railway service on August 4, 1908, as a chairman on the Pittsburgh division of the Pennsylvania and was promoted successively to rodman on the Monongahela division and to transitman in the general offices at Philadelphia, Pa. On May 1, 1915, he was promoted to assistant supervisor on the Bellwood division, with headquarters at Irwona, Pa., later being transferred to Watson-town, Pa., and Philadelphia. He was in military service from October 1, 1917, to July 10, 1919, serving with the 21st Engineers. On leaving the army he was promoted to supervisor, with headquarters at West Brownsville, Pa., and served in this position successively at Paoli, Pa., Downingtown, West Brownsville and Johnstown. He was located at the latter place at the time of his recent promotion to division engineer.

Raymond Swenk, whose promotion to engineer maintenance of way of the Southern division of the Pennsylvania, with headquarters at Wilmington, Del., was noted in the February issue, was born on January 3, 1886, at Sunbury, Pa. He graduated from Pennsylvania State College in 1907. He entered railway service on June 17 of the same year as a rodman on the Sunbury division of the Pennsylvania and was later promoted to transitman. On May 1, 1914, he was promoted to assistant supervisor on the Delaware division, with headquarters at Clayton, Del., and was transferred successively to Camden, N. J., and to the Philadelphia Terminal division. On September 16, 1918, he was promoted to supervisor on the Schuylkill division, with headquarters at Norristown, Pa., and later was transferred to Middletown, Pa., and Paoli. He was promoted to division engineer of the Pittsburgh division, with headquarters at Pittsburgh, Pa., on November 1, 1924, in which position he was serving at the time of his recent promotion to engineer maintenance of way of the Southern division.

Changes on the Erie

The lines composing the Erie system have been formed into two grand divisions, designated as the Eastern and Western districts, the former comprising the lines west of Port Jervis, N. Y., and Stroudsburg, Pa., to and including Buffalo and Salamanca, while the Western district is composed of the lines west of the two last named places, superseding the former division into three regions. **Robert S. Parsons**, vice-president of the Ohio region, has been appointed chief engineer of the system, succeeding **Robert C. Falconer**, whose promotion to engineering assistant vice-president is noted elsewhere in this issue, and **George S. Fanning**, principal assistant engineer, with headquarters at New York, has been promoted to assistant chief engineer, with the same headquarters. **J. C. Patterson**, engineer of the New York region, with headquarters at Jersey City, N. J., has been promoted to engineer maintenance of way of the system, with headquarters at New York. **I. H. Schram**, engineer of the Chicago region, with headquarters at Chicago, has been appointed engineer maintenance of way of the Eastern district, with headquarters at Hornell, N. Y., and **Harold Knight**, engineer of the Ohio region, with headquarters at Youngstown, Ohio, has been appointed engineer maintenance of way of the Western district, with the same headquarters.

Mr. Fanning was born on April 25, 1885, at Detroit, Mich., and graduated from the University of Michigan in 1906. He entered railway service in the latter year as assistant engineer of alignment on the construction of the Michigan Central tunnel under the Detroit river, serving in this position until 1910 when he became resident engineer on the construction of new lines for the Algoma Central & Hudson Bay and the Algoma Central in the Province of Quebec. He entered the service of the Erie in March,

1913, as resident engineer on second track and grade reduction work on the Meadville division and in January, 1914, was promoted to estimating engineer, with headquarters at New York. He was promoted to chief draftsman in May, 1916, and assistant to the chief engineer in June, 1918. He was made office engineer in March, 1920, and in May, 1925, was promoted to principal assistant engineer.

Mr. Parsons was born on May 26, 1873, at Hohokus, N. J., and graduated from Rutgers College. He entered railway service in 1895 as a rodman on the New York



Robert S. Parsons

division of the Erie and was promoted to assistant engineer in January, 1898. From 1899 to 1907 he was successively assistant engineer and division engineer of the New York, Susquehanna & Western and the Wikesbarre & Eastern (both of which roads were controlled by the Erie) and engineer maintenance of way of the Erie, with headquarters at Cleveland, Ohio. He was appointed superintendent of the Susquehanna division in 1907 and in 1910 was transferred to the New York division. On January 1, 1913, he was promoted to assistant general manager of the lines east of Salamanca and Buffalo, with headquarters at New York and in 1914 was further promoted to general manager of the Ohio grand division, with headquarters at Cleveland, Ohio. He was appointed chief engineer in January, 1916, and in 1917 served as assistant to the president and chief engineer. In November, 1917, he was appointed assistant to the president and general manager, which position he held until the period of federal control, when he was again appointed chief engineer. On the return of the roads to private operation in 1920 he was promoted to general manager, with headquarters at New York, and in 1922 was further promoted to vice-president in charge of operation with the same headquarters. He was appointed vice-president of the Ohio region in 1923, in which position he was serving at the time of his recent appointment as chief engineer.

Mr. Patterson was born in 1882 at Carmichaels, Pa., and graduated from Pennsylvania State College in 1905. He entered railway service in the same year with the Pennsylvania, and in August, 1906, entered the employ of the New York Central where he remained until April, 1907, at which time he became connected with the Cleveland, Cincinnati, Chicago & St. Louis. From October, 1907, to April, 1909, he was engaged in levee and drainage work, returning to railway service on the latter date with the Northern Pacific, where he remained until October, 1909, when he entered the employ of the Chicago Great Western. He became chief draftsman on the Erie in July, 1913, and was promoted to assistant valuation engineer in May, 1916. He was promoted to office engineer in February, 1917, and in July, 1918, was further promoted to principal assistant engineer, with headquarters at New York, remaining in that position until 1921, when he was promoted to regional engineer.

Track

C. P. Willis, assistant supervisor on the Pennsylvania, has been promoted to supervisor on the C. and P. division, with headquarters at Ravenna, Ohio, succeeding **G. H. Schlottner**, who has been transferred to the Eastern division, with headquarters at Freedom, Pa. **I. S. Pringle** has been appointed supervisor on the Renovo division, with

headquarters at Emporium, Pa., and **C. W. Van Nort** has been appointed supervisor on the Pittsburgh division, with headquarters at Johnstown, Pa., where he succeeds **J. L. Gressit**, whose promotion to division engineer, with headquarters at Richmond, Ind., is noted elsewhere in this issue. **C. P. Sipe**, **C. K. Kuszmil** and **F. M. Oyler** have been appointed assistant supervisors on the Pittsburgh division, with headquarters at Pittsburgh, Pa., Pittsburgh South Side and Gallitzen, respectively. **Oliver Downes** and **Joseph Summers** has been appointed assistant supervisors on the Conemaugh division, with headquarters at Verona, Pa., and Blairsville, respectively. **G. A. Sawyer** has been appointed assistant supervisor on the Buffalo division, with headquarters at Olean, N. Y. **A. P. Talbott** has been appointed assistant supervisor on the Renovo division, with headquarters at Erie, Pa., and **W. W. Boyer** has been appointed assistant supervisor on the Eastern division, with headquarters at Wooster, Ohio.

W. Downie, section foreman on the Temiskaming & Northern Ontario at Englehart, Ont., has been promoted to roadmaster on district No. 3, with headquarters at Proquis Junction, Ont., take the place of **R. Killens**, deceased.

Anthony McMahon has been appointed roadmaster on the Wisconsin Valley division of the Chicago, Milwaukee & St. Paul, with headquarters at Wausau, Wis., succeeding **B. J. Deneen**, who has been assigned to other duties. **Frank Larson** has been appointed roadmaster on the I. & M. division, with headquarters at Wabasha, Minn., replacing **E. E. McLellen**, who has resigned.

S. E. Gordon, whose appointment as roadmaster on the Southern Pacific, with headquarters at Marysville, Cal., was noted in the January issue, was born on June 11, 1888, at Wamic, Ore., and entered railway service on June 2, 1902, as a chainman on the Columbia-Southern (now a part of the Oregon-Washington Railroad & Navigation unit of the Union Pacific system) during his school vacation. In 1903 and 1904 he served during the vacation periods as a levelman on location and an instrumentman on construction, respectively, on the Great Southern and in February, 1905, after leaving school, he became a draftsman on the Oregon Trunk, being promoted to transitman on location in December of the same year. In November, 1906, he left the Oregon Trunk to become a draftsman in the maintenance of way department of the Southern Pacific and in April, 1907, was promoted to transitman in the construction department. In February, 1908, he left railway service to become a draftsman for the Lawyers Abstract Company, Portland, Ore., and returned to the Southern Pacific as resident engineer on the construction of the Tillamook branch in August, 1909, serving in this capacity until November of the same year, when he returned to the Oregon Trunk as assistant engineer on location and construction, where he remained until October, 1911. Following this he was engaged on various railroad and highway construction work in Oregon, Washington, California and Canada. He returned to the Southern Pacific in January, 1917, as an assistant engineer on maintenance of way work on the Portland division and in March, 1923, was transferred to the Salt Lake division on second track construction. In December of the same year he was transferred to the construction department, where he was located at the time of his recent promotion to roadmaster, with headquarters at Maryville, Cal.

Purchasing and Stores

J. H. Jeffery, chief clerk to the chief engineer of the Western lines of the Canadian Pacific, with headquarters at Winnipeg, Man., has been promoted to general tie agent of the Western lines, with the same headquarters, succeeding **R. G. Barnwell**, who retired on December 31, 1926, in accordance with the company's retirement plan. Mr. Barnwell was born on September 18, 1852 and entered the service of the C. P. R. on June 17, 1883, as a night clerk in the stores department at Winnipeg, since which time he had been continuously with the company serving in various capacities.

Bridges and Buildings

W. E. Allen, general foreman on the Canadian National at Montreal, Que., has been promoted to acting bridge and building master, with the same headquarters, succeeding **P. J. Phelan**, deceased.

E. A. Roberts, master carpenter on the Pennsylvania, with headquarters at Erie, Pa., has been transferred to the C. and P. division, with headquarters at Wellsville, Ohio. **H. J. Kerstetter** has been appointed master carpenter on the Buffalo division, with headquarters at Olean, N. Y.

Obituary

W. E. Roe, roadmaster on the Canadian National, with headquarters at Edson, Alta., died in the Royal Alexandra hospital at Edmonton, Alta., on January 1, from a fractured skull resulting from a fall from an elevator hoist while inspecting an ice house at Jasper, Alta.

F. A. Nolan, roadmaster on the First district of the Dakota division of the Great Northern, with headquarters at Breckenridge, Minn., who was granted a leave of absence on account of sickness as noted in the January issue, died on January 7, after 37 years' service as a roadmaster on the Great Northern.

William J. Metcalf, formerly a roadmaster on the Chicago, Milwaukee & St. Paul, with which company he was connected for almost 27 years, died at his home at Ottumwa, Iowa, on October 30, 1926, at the age of 62 years. Mr. Metcalf entered railway service as a section laborer on the Omaha, Kansas City & Eastern (now the Quincy, Omaha & Kansas City) in June, 1893. He entered the service of the Chicago, Milwaukee & St. Paul in February, 1900, as an assistant extra gang foreman on the Kansas City division and later was promoted to section foreman at Sturges, Mo. In April, 1902, he was transferred to Oxford Junction, Iowa, being placed in charge of an extra gang during a portion of 1925. In 1912 he was promoted to extra gang foreman on second track work between Savanna, Ill., and Marion, Iowa, serving in this capacity until March 28, 1916, when he became section foreman on the Kansas City division at Mystic, Iowa. He was promoted to roadmaster on the Kansas City division in 1918, which position he held until April 20, 1926, when failing health compelled him to resign.

Robert Bruce Robinson, engineer maintenance of way of the Union Pacific, with headquarters at Omaha, Neb., died on February 1, at St. Joseph's hospital in that city from blood poisoning resulting from the extraction of an abscessed tooth on January 22. Mr. Robinson was born on March 3, 1878, at Holly Springs, Pa., and received his engineering education at the University of Illinois. He entered railway service in April, 1899, as a rodman on the Kansas division of the Union Pacific. In 1904, he entered the service of the Oregon Short Line unit of the Union Pacific system and was engaged for several years in the

location and construction of branch lines. After spending some time as a special engineer on investigation work he was promoted to division engineer and in 1916 was promoted to engineer maintenance of way of the O. S. L., in which capacity he served until May, 1919, when he was promoted to engineer maintenance of way of the Union Pacific, which position he was holding when he died.



R. B. Robinson

Construction News

The Atlantic City has been granted authority by the Interstate Commerce Commission to construct a branch line from its main line in West Cape May in a westerly direction for 2.64 miles to a terminal at the western end of Sunset boulevard, Cape May Point, adjacent to the wharf of the Lewes-Cape May Ferry Company, to cost about \$107,358.

The Baltimore & Ohio has awarded a contract to Milo Hanke of Cincinnati, O., for the construction of a yard office at Rossford, Toledo, O., at an estimated cost of \$25,000. Bids will close on March 1 for the construction of a 600-ton four track concrete coaling station, sanding facilities and ash-handling equipment at Ohio Junction, Ohio.

The Bessemer & Lake Erie has authorized the replacing of the present timber highway bridge with a new steel bridge, with concrete floor and foundations at Hulton road, Black's Run, Pa., at an estimated cost of \$30,000, which work is to be done by railroad company forces.

The Canadian National has awarded a contract to J. Coughlan & Sons, Vancouver, B. C., for the construction of a bridge over the Thompson river near Kamloops, B. C., to cost about \$200,000. Plans have been prepared for the construction of a passenger station at Edmonton, Alta.

The Central of Georgia has received bids for the construction of a viaduct on Bay street at Savannah, Ga., which, it is estimated, will cost \$500,000.

The Central Railroad of New Jersey has awarded a contract to Young & French for the construction of concrete abutments, etc., of a bridge at Kearny, N. J., at an estimated cost of \$51,364.

The Chicago & North Western has awarded a contract to the Ellington Miller Company, Chicago, for the construction of a pattern storage house at the Crawford avenue, Chicago, shops at a cost of about \$25,000.

The Chicago, Milwaukee & St. Paul has been authorized by the federal court at Chicago to expend \$75,000 for the renewal of a 54-span pile trestle, 850 ft. long and 59 ft. high, at Manitou, Wash. Embankment will be substituted for 8 spans at the east end of the present bridge and for 23 spans on the west end.

The Chicago, Rock Island & Pacific budget for 1927 provides for the construction of second main track between McFarland, Kan., and Alta Vista, 22 miles, completing the double track between Topeka, Kan., and Herington, 82 miles, and from Hutchinson, Kan., to a point three miles west, involving a total expenditure of about \$1,000,000. Company forces will be employed in the erection of bridges for the second track. Water-treating plants will be constructed at Armourdale, Kan., and Marion and Shawnee, Okla., with additions to yards planned for Joliet, Ill., and Peoria, Newton, Iowa, Armourdale, Kan., and Herington, Sayre, Okla., and Shawnee. Additions to shops and roundhouses will be constructed at Silvis, Ill., Chicago and Peoria, Valley Junction, Iowa, Council Bluffs, and Cedar Rapids, Trenton, Mo., Herington, Kan., Dalhart, Tex., and Amarillo. The construction of a line across the South Canadian river, north of Amarillo, Tex., has been authorized for completion to Stinnett by June 30. This project will include the construction of a temporary bridge over the South Canadian river. The present line is practically completed to Fritch, Tex., 34 miles, and the new construction north of the South Canadian river to Stinnett involves 15 miles of line.

The Chicago, Springfield & St. Louis contemplates the construction of a roundhouse and improvements to its yards at Springfield, Ill.

The Delaware, Lackawanna & Western has awarded a contract to the American Bridge Co. of New York City, for the Hackensack River drawbridge at Kearny, N. J., which is estimated to cost \$1,000,000. This company has

also awarded a contract to the Foundation Co., New York City, for steel work and piers at an estimated cost of \$1,000,000, and another contract has been awarded to H. F. Curtis, New York City, for approaches, concrete work and filling to cost about \$1,000,000. A contract has also been awarded to James A. Hart Co., New York City, for grade crossing elimination and a passenger station at Paterson, N. J., at an estimated cost of \$300,000.

The Erie has received bids on a reinforced concrete warehouse at Youngstown, Ohio.

The Fairport, Painesville & Eastern has applied to the Interstate Commerce Commission for authority to build a line from a point near Painesville to a point near Madison, Ohio, about 6 miles, and a spur of 2 miles.

The Illinois Central, the Louisville & Nashville, the Nashville, Chattanooga & St. Louis and the Union have reached an agreement with the City of Memphis whereby the four railroads will bear 80 per cent of the cost of constructing the Aulon viaduct over their lines at Memphis, Tenn. The viaduct, which will be 2,300 ft. long and 36 ft. wide, will involve an expenditure of approximately \$300,000. A contract for the construction of car repair facilities at Paducah, Ky., has been let to Joseph E. Nelson & Sons, Chicago, at a cost of about \$200,000.

The Louisville & Nashville closed bids on February 21, for the construction of a one-story brick and hollow tile passenger station at Edgewater Park, Miss.

The Long Island intends to spend approximately \$43,000,000 for construction work in the next five years, according to George Le Boutillier, vice-president, testifying before the Public Service and Transit Commission on the increase in commutation rates. Grade crossing elimination will require \$13,200,000; opening new streets across the railroad's right of way, \$1,000,000; electric, \$11,500,000; automatic train control, \$1,650,000; \$5,000,000 for a terminal at Diagonal street, Long Island City; \$2,000,000 for improvements related to grade crossing elimination; \$2,000,000 for increased power facilities; \$4,000,000 for additional freight facilities; \$500,000 additional shop facilities; \$1,000,000 for new passenger stations and lengthening platforms of existing stations; and \$1,000,000 for additional tracks.

The Minnesota Western, according to an announcement by Erle D. Luce, vice-president and general manager, plans to apply to the Interstate Commerce Commission within the next three months for permission to construct a line between Montevideo, Minn., and Brookings, S. D., about 60 miles, to connect with an extension now nearing completion from Lake Lillian, Minn., the present terminus, to Montevideo. The cost is estimated at \$1,200,000.

The Missouri-Kansas-Texas budget for 1927 includes the replacement of the superstructures of three steel bridges, one 200 ft. long at Boughner, Mo., another 150 ft. long at Rocheport, Mo., and a third 143 ft. long at Crowder, Okla., with through riveted truss spans designed for Cooper's E-60 loading. Negotiations are under way between this company, the Houston & Texas Central and the City of Ft. Worth, Tex., for the construction of a reinforced concrete highway undercrossing at Capps street, to cost about \$250,000.

The Missouri Pacific has awarded a contract to T. H. Johnson, Sedalia, Mo., for the construction of a one-story steel and concrete machine shop, 50 feet by 126 feet, at Nevada, Mo. A contract has been let to H. J. Hanson & Son, Brownsville, Tex., for the construction of a passenger station at San Juan, Tex., to replace a building destroyed by fire. The station will be constructed of stucco and tile in the Spanish type of architecture.

The New Orleans Public Belt has prepared plans and specifications for the construction of a combination railroad and highway bridge over the Mississippi river at New Orleans. Negotiations for its use on a specified cost per car movement by the several railroads entering New Orleans are now underway as a basis for financing the project, which it is estimated will cost \$14,000,000.

The New York Central has awarded a contract to the Newton & Baxter Company, Toledo, Ohio, for the con-

struction of a car repair shop at Toledo, to cost approximately \$75,000.

The New York, New Haven & Hartford has awarded a contract to Henry R. Kent & Co. of Rutherford, N. J., for alterations to an engine room and addition to power plant facilities at Readville, Dedham, Mass., at an estimated cost of \$150,000.

The Pennsylvania has awarded a contract to Hoeffer & Co. of Chicago, Ill., for the construction of the superstructure for the 51st Street subway at Chicago. Approval of the construction of an eight-span deck plate girder bridge, with ballasted concrete floor, over the Wabash River at Terre Haute, Ind., has been given by the United States War Department. The bridge, which will have a total length of 1,000 feet, will involve an expenditure of about \$600,000.

The Reading has awarded contracts to Swanger & White, Lebanon, Pa., for grading and masonry, and to the LeRoy Roofing Company for waterproofing, in connection with rebuilding two three-track bridges Nos. 26/02 and 26/70 on the Gettysburg and Harrisburg Railroad, Harrisburg division, located east of Moor's Mill, Cumberland County, Pa. The Reading also plans to strengthen six bridges between Boiling Springs and Harrisburg, Pa.

The Southern Pacific has awarded a contract to the Neil Warner Company, Turlock, Cal., for the construction of a passenger station at Merced, Cal., to cost about \$150,000. A building permit has been obtained for the construction of a brick and steel fruit and vegetable warehouse facing on Front Street at New Orleans, La. The main structure, which will be 300 feet long, will include an office building and warehouse space for the temporary storage of fruits and vegetables. The cost is estimated at \$100,000.

The Temiskaming & Northern Ontario will be extended from its present terminus at Island Falls Junction, Ont., north to James Bay if the plans contemplated by the Ontario government are carried out. The extension would be 85 miles long and the estimated cost is \$5,500,000.

The Texas & Pacific contemplates the construction of a yard and engine terminal at Ft. Worth, Tex., which is expected to involve an expenditure of about \$2,500,000. Bids for grading on this project will be invited in the near future.

The Wabash has awarded a contract to the Stewart Construction Company for the construction of an addition to the grain elevator at North Kansas City, Mo., to cost approximately \$500,000.

The Wenatchee Southern has awarded a contract to the Henry & McFee Contracting Company, Seattle, Wash., for the construction of a line from Wenatchee, Wash., to Beverly, 53 miles, and from Hanford, Wash., to Kennewick, 30 miles. At Beverly the line will connect with the Chicago, Milwaukee & St. Paul, over whose tracks it will operate to Hanford, 46 miles.



North Coast Limited of the Northern Pacific

Supply Trade News

R. A. Foster, vice-president of the L. B. Foster Company, Pittsburgh, Pa., is in charge of the office opened by this company recently in Chicago, in the Illinois Merchants Bank Building, 231 LaSalle Street.

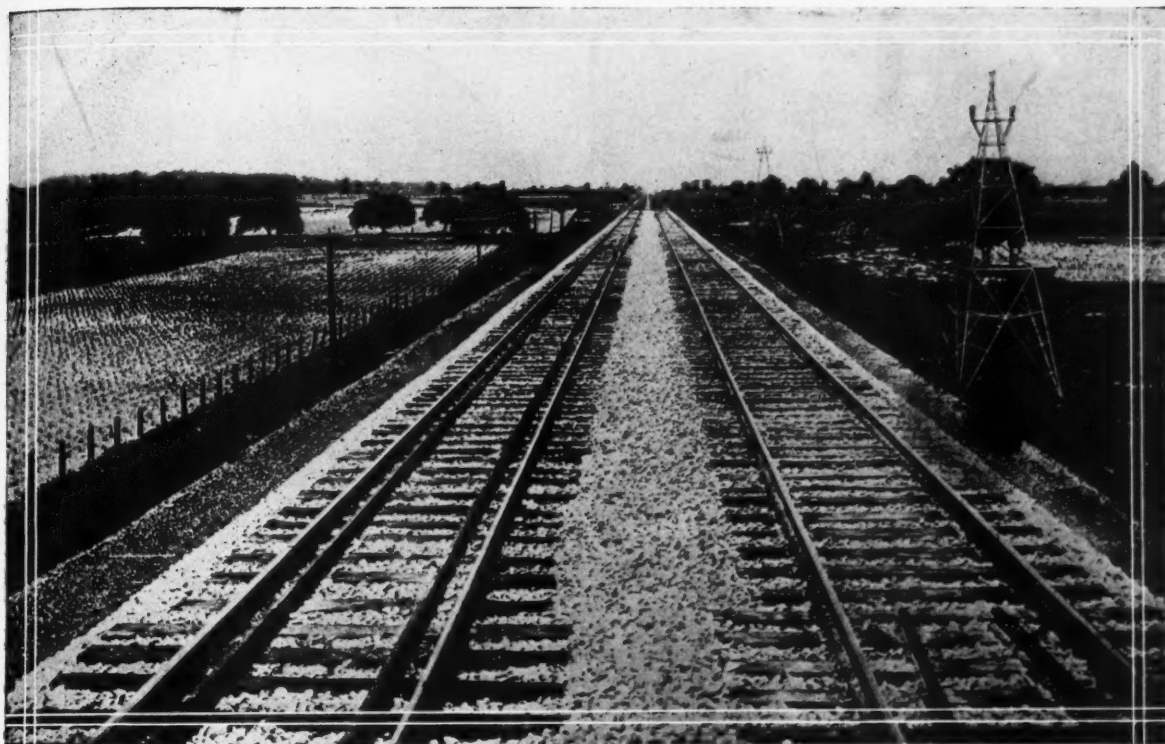
Albert Swartz, sales manager of the Interstate Railway Supply Company, Cleveland, Ohio, has joined the staff of the Pettibone Mulliken Company, which has purchased the first mentioned company. Mr. Swartz will have charge of the sales of manganese guard rails and rail anchors formerly sold by the Interstate Railway Supply Company.

G. LaRue Masters, in charge of sales in the United States and Canada, of the car window equipment department of the National Lock Washer Company, Newark, N. J., has been promoted to assistant general sales manager of that company, with which he has been connected for the past six years. Mr. Masters was born in Philadelphia and prior to entering the service of the National Lock Washer Company was connected for 12 years with Unger Brothers, Newark, N. J.

H. O. K. Meister, assistant sales manager of the Hyatt Roller Bearing Company, Newark, N. J., with headquarters at Newark, has been promoted to general sales manager, with the same headquarters, and **O. W. Scarrett**, assistant chief engineer, with headquarters at Newark, has been promoted to chief engineer, with the same headquarters. Mr. Meister joined the Hyatt forces more than 14 years ago as an engineer in the offices at Newark, and was later transferred to the Chicago office, where, after a few years, he took over the supervision of sales in the western territory. Eighteen months ago he was promoted to assistant sales manager, which position he was holding at the time of his recent promotion to general sales manager. The Pittsburgh offices, which were recently named as headquarters for the central sales division, are now located at 806 Fulton Building, to which they were moved from 1352 Union Trust Building. **B. H. Lytle** is in charge of the central division and **H. R. London** has joined the Pittsburgh force.

F. W. Nixon will be resident manager of the Chicago office of the Railroad Accessories Corporation, New York, which will be opened on March 1 at 1511 Railway Exchange building. Mr. Nixon was born on June 1, 1883, at Westfield, N. Y., and entered railway service in June, 1903, as a laborer on the Lake Shore & Michigan Southern (now a part of the New York Central). In April, 1905, he was transferred to the signal department as a laborer and in April, 1906, he became a signal mechanic with the Hall Switch & Signal Company. In June of the same year he became a mechanic on construction with the Union Switch & Signal Company. In 1907 he was employed on the Union Pacific on extra maintenance and construction work, returning to the Union Switch & Signal Company in October of the same year as wire man and sub-foreman. He remained with this company until May, 1910, when he entered the employ of the General Railway Signal Company as wire man in the Western district and in September of the same year was promoted to foreman on general construction in charge of special installations. In March, 1916, he was transferred to the commercial engineering department at Rochester, N. Y., supervising construction cost accounting, factory delivery of construction materials and other special work. He was promoted to assistant superintendent of construction in 1923 and held this position until assuming his new duties as resident manager for the Railroad Accessories Corporation.

Out of a total of 290 highway crossing accidents on the Missouri Pacific during 1926, 114 were caused by vehicles being driven into or against the sides of trains. In the Southern district, which embraces Arkansas and Louisiana, 37 accidents out of a total of 163 were caused by vehicles being thus driven against trains. Both of these states have laws requiring motorists to bring their cars to a complete stop before crossing railroad tracks.



Consistent Uniformity

Chemical Weed Killers Need Uniform Application

LACK of uniform results in weed killing is due to irregular distribution of chemical.

Chipman "Geared-to-the-Axle" Spraying Equipments coordinate distribution with train speed. All guesswork is eliminated. Chipman sprays are compensated for pressure so that whether one or nine spray nozzles are open they will all function equally.

ATLAS NON-POISONOUS WEED KILLER provides the means of making

complete coverage over a line when used in conjunction with Atlas "A". Atlas "NP" permits a full service through station grounds, grazing territory or water drainage country where Atlas "A" might poison humans or animals, and should also be used where resistant varieties of weeds are present.

Chipman Service permits the use of both chemicals in one spray train. The turn of a valve instantly changes from one to the other. The result is a complete and uniform treatment.

Write for descriptive booklets

CHIPMAN CHEMICAL ENGINEERING CO., INC.
BOUND BROOK, N. J.

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Factories

Palo Alto, Cal.

Houston, Tex.

[The Chipman Chemical Engineering Co., Inc., is
sole licensee for Non-Poisonous Weed Killer under
United States Patent No. 1,534,289.]

ATLAS
NON-POISONOUS
SERVICE



Enforcing "safety first"

Where the right of way runs through thickly populated districts, Page Chain Link Fence offers the most efficient and economical means of preventing trespass—of protecting the public from itself.

And where shops, warehouses and other forms of railroad property must be safeguarded—PAGE Fence presents an impassable barrier that keeps the curiosity seeker, the mischief maker and the malicious intruder at a distance.

PAGE engineers have made a study of railroad protection problems. They will work with you, submitting plans and estimates, without obligation. Write for interesting literature and the name of the nearest distributor.

Copper-bearing steel, heavily galvanized after weaving. All fittings, too, zinc coated to resist rust.



PAGE FENCE ASSOCIATION

215 North Michigan Avenue, Dept. C8
Chicago, Ill.

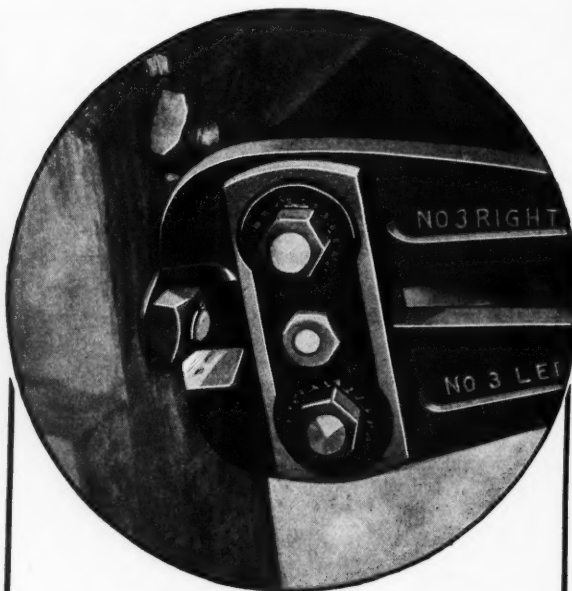
Distributing chain link products made by the Page Steel and Wire Company, Bridgeport, Conn., an Associate Company of the American Chain Company Incorporated.

In Canada: Dominion Chain Company, Limited, Niagara Falls, Ontario

PAGE

Chain Link

FENCE



Wrench Won't— NUT SPLITTER WILL

Nuts peened or rusted on may be easily split by a Porter Bolt Clipper with standard Nut Splitter jaws (either side or end on). These tools in the largest size will easily split the nut of a 5-8" bolt, and if properly used will not damage the thread on the bolt.

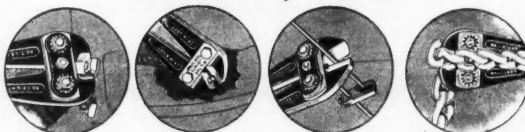


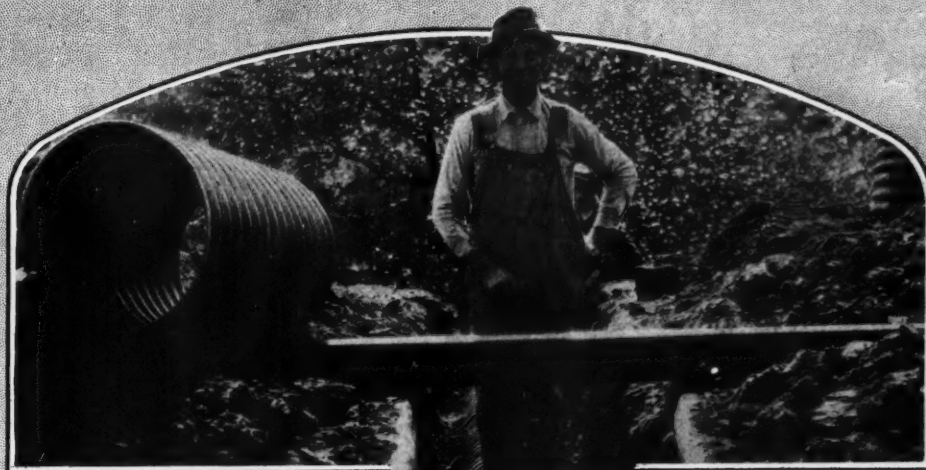
Time Savers PORTER'S BOLT CLIPPERS

are cutting tools developing great power through leverage and a form of toggle joint. They multiply man-power about 70 times. Made in a number of styles for cutting bolts and rods, splitting nuts, cutting chains, etc. Moderate in cost and essential tool equipment for bench, shop, or kit.

Sold by Jobbers and Supply houses everywhere
Ask your dealer or write to us for booklet

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EVERETT, MASS.





Three reasons for 300 Culverts

SPI-COR
Cast Iron Spiral Corrugated Culvert Pipe

Permanence! Low installation cost! No traffic interruption! There are the three reasons why the C. & O. Ry. have used Spi-Cor pipe, this year, in more than 300 permanent culverts on their lines through West Virginia.



Make a test installation with Spi-Cor. Keep careful records of time, labor, cost. Then you will know why it will pay your lines to standardize on Spi-Cor this year.

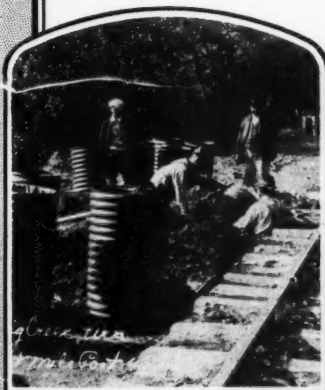
American Casting Co.

Culvert Pipe Headquarters
Birmingham, Ala.

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NEW YORK
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GREEN BAY, WIS.
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When A Small Gang Out-Works A Big One

It takes twenty or more tong men to handle 33 1/3 ft. 130-pound rails while five men with the "Three-Man Rail Layer" will do the same work faster. Consequently, when you equip a gang with the "Three-Man Rail Layer" you not only drop 17 or 18 men from the pay roll but you also lay more steel.

This machine is easily removed from the track. Doesn't tie up traffic.

Coliseum Spaces 137 and 138

MAINTENANCE EQUIPMENT CO.

Labor Saving Devices

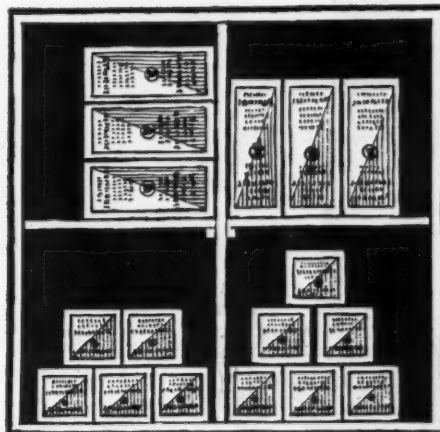
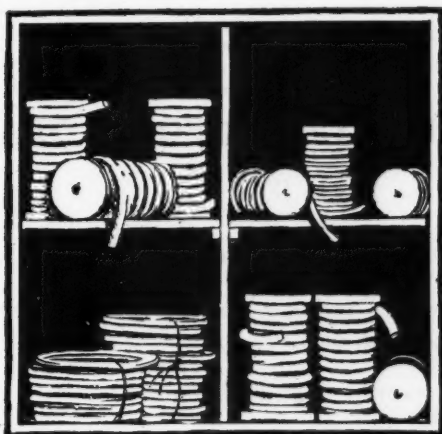
Railway Exchange, Chicago, Illinois

Manufactured by
The Royal Blue Bed Spring Co.
 formerly The M. A. Hunt Co.
 Cincinnati, Ohio

Write for descriptive circular
 and prices.

The Bunk cannot be set up wrong if slots are down
 in place over the shoulder rivets as shown in cut.

Bunk Folded Ready for
 Shipment or Storage



*Here's
the
Difference between
"just packing" and "packing service"*

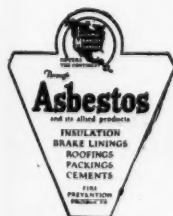
"Just Packing" means casual buying with the risk of overstocked shelves, unnecessary styles, costly errors in orders and requisitions, and wasteful left-overs.

"Packing Service" means systematic buying with the certainty of just the right quantity of just the right styles on your stock room shelves—a minimum investment, practically no obsolescence, no mistakes, and no waste from incorrectly cut rings and left-over ends.

Packing Service pays. It is part of Johns-Manville "Service to Railroads."

JOHNS-MANVILLE CORPORATION., Madison Ave. at 41st St., New York
Branches in all large cities

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JOHNS-MANVILLE

Service to Railroads

NORTON JACKS

"STANDARD ON AMERICA'S RAILWAYS FOR FORTY YEARS"

Style 912

A New Model for Bridge and General Use

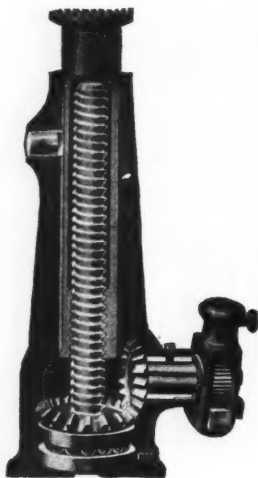
Primarily designed for stringer use in bridge work, but adapted to many other purposes.

Small, offset base permits use in close places.

Light weight and one man can easily raise its capacity load.

Specifications

Height, 14 $\frac{3}{4}$ in.—Rise, 9 in.—Size of base, 6x7 $\frac{1}{2}$ in.—Capacity, 12 tons—Weight, 40 lb. Price on application.



A. O. NORTON, INC.

Established 1886

*The Original Manufacturer of Ball-Bearing and Self-Lowering Jacks
General Sales Offices*

310 S. Michigan Ave., Chicago, Ill.

Works:

Moline, Ill.

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PUMPS

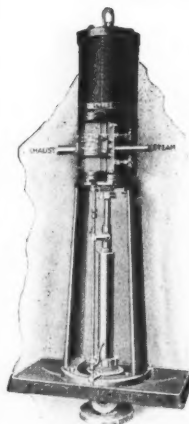
that help pay the maintenance

COOK Single-Stroke, Deep-Well Steam Head

Virginia reports: "Have 6"x36" Steam Head with 4" Cased Working Barrel, pumping from a 6" well, 135 feet deep to 60 feet above surface. Our pump has been installed over twenty years and has always given excellent service."

COOK Type PH, Overlapping Two-Stroke, Self-Oiling, Deep-Well Pump

Capacities up to 500 gallons per minute.
Sizes: 2 H. P., 5 H. P., 7 $\frac{1}{2}$ H. P., 10 H. P.,
15 H. P., 25 H. P.



President Sedler appreciates service: "The operation of this pump under the demands of constant service we feel has been exceptional, and we want particularly to compliment your company on having turned out the most efficient, as well as the smoothest running deep well pump the writer has ever seen. Superintendent Perkinson writes: "The oiling system alone is enough to sell the pump as it will pay for it in a few years."

Bulletin 227—COOK Tubular Well Supplies
Bulletin 30F—COOK Patent Brass Tube Well Strainer
Bulletin 126—COOK Deep-Well Steam Head
Bulletin 35A—COOK Type PH Deep-Well Pump



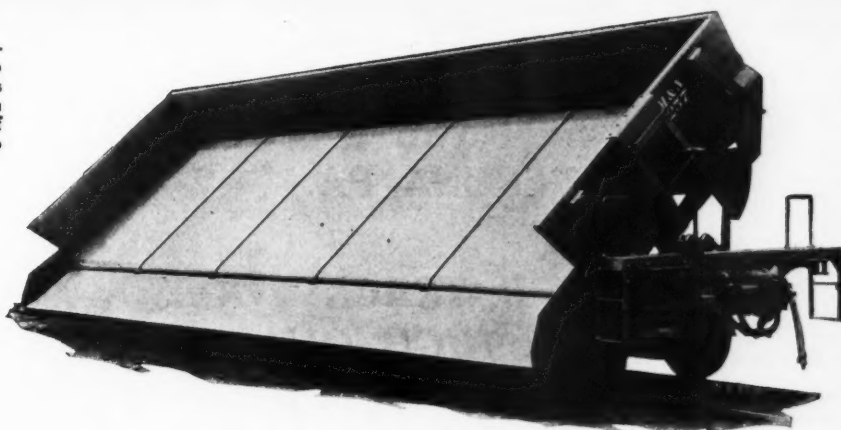
Type PH-10

A. D. COOK, Inc.

Lawrenceburg, Indiana

CHAS. F. HARRIS, District Manager
343 S. Dearborn St., Chicago, Ill.

The Koppel Drop Door type is furnished in capacities of 12 yards to 30 yards.



The Koppel Lift Door type is furnished in capacities of 12, 16, 20, 30 and 45 yards.

The Koppel Automatic Air Dumping Car

Every inch a distinctly Koppel-built car — furnished with either drop door or lift door—both with a clean, free discharge—positive in dumping and locking action.

Write for literature.

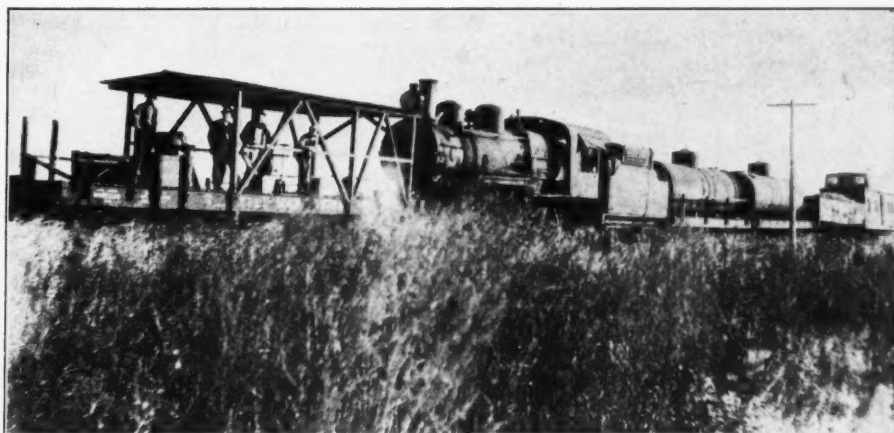
Koppel Industrial Car & Equipment Company

Koppel

Sales Offices: Pittsburgh New York Chicago San Francisco

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MAINTAINING A CLEAN TRACK AT ALL TIMES



**Dean-Williams
WEED
DESTROYER**

(Patented)

**Kills Vegetation and
Clears Frogs and
Switches of Snow
and Ice with Super-
heated Steam.**

Will not cause fires or poison stock. Performs the work of many men.

Machines are now being used by a number of the larger railroads, including: The Missouri Pacific—Northern Pacific—Nashville, Chattanooga & St. Louis—Central of Georgia—Atlantic Coast Line.

Correspondence and Investigation Solicited—Inquiries Answered Promptly.

DEAN-WILLIAMS WEED DESTROYER COMPANY

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WOODINGS FORGE & TOOL CO. VERONA, PA.

**STANDARD TRACK TOOLS
OF VERY HIGH QUALITY**

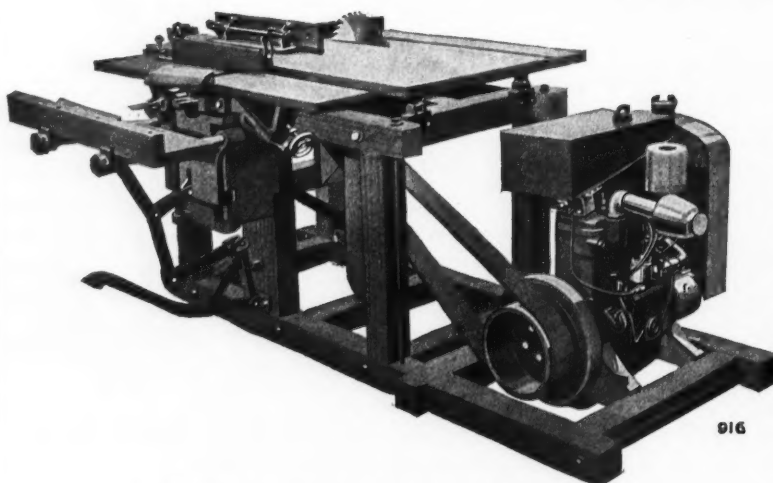
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VARIETY WOODWORKER

With Gasoline Motor
Portable—Stationary
With Electric Motor

For use
on the Job
or
in the Shop



This efficient, energetic workman never sulks, nor grouches, nor asks for more pay.

Eliminates the burdensome manual labor of ripping, cutting off and planing and performs many other useful operations with surprising ease and dispatch.

Used by prominent construction concerns and by railway maintenance of way departments.

Portable Variety Woodworker with Eight H. P. Engine
Ask for Bulletin No. 82 or Complete Catalog No. 25

AMERICAN SAW MILL MACHINERY CO.
164 MAIN ST., HACKETTSTOWN, N. J.

33% *more* Ability to Bend

ACIPCO MONO-CAST PIPE

TENSILE strength is not a complete measurement of the ability of cast iron pipe to ~~serve~~ service. There must also be the ability to bend.

Sudden ground slips—severe strains over short distances illustrate the amazing flexibility of our MONOCAST Pipe.

Monocast Pipe has a tensile strength of 25,000 pounds per square inch. That gives it the ability to withstand hydrostatic pressure. Yet at the same time Monocast Pipe bends 33 per cent more than any centrifugal cast iron pipe made, thus combining resistance with resiliency.

AMERICAN CAST IRON PIPE COMPANY
ACIPCO MONO-CAST PIPE
CENTRIFUGAL
BELL AND SPIGOT



The Mark of Dependable Property Protection

Today, leaders among American railroads, regard Cyclone Fence as an indispensable part of modern equipment for yards, shops, terminals, and rights of way.

Cyclone Fence stops thefts and vandalism; bars all outside annoyances. By protecting property and promoting system, Cyclone Fence effects savings which far outweigh its cost. Naturally, these economies in maintenance and operation are reflected in increased earnings.

Write nearest offices for complete information.

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Pacific Coast Distributors:

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Northwest Fence & Wire Works, Portland, Ore.
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Cyclone Fence

Reg. U. S. Pat. Off.



Cyclone Wrought Iron Fence
for Railroad Property

The Cyclone Fence Company extend an invitation to Railway officials to visit the Cyclone Booth, No. 252, while attending the National Railway Appliances Association Exhibit at Chicago Coliseum, March 7 to 10.

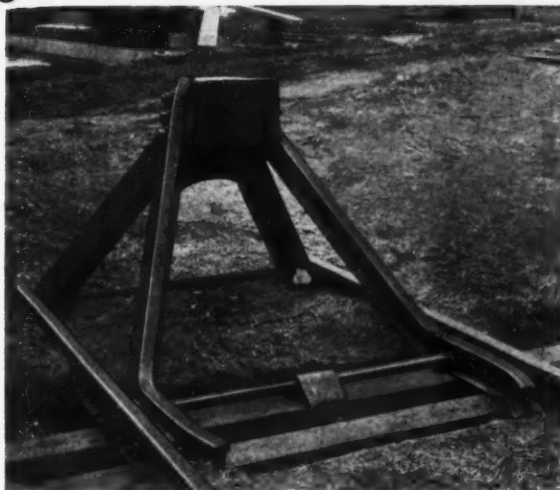
CYCLONE PROPERTY PROTECTION PAYS

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Increasing the strength of the Strongest Bumping Post to meet the increased weight of cars.

The Durable Bumping Post has been greatly strengthened through the use of a heavy forged steel solid spreader bar between the rails at the point where the bumping post rails join the running rails. In addition to this solid spreader bar, the post is now equipped with a heavy clamp formed to fit over the top of this spreader bar and bent down so that the two ends overlay the tie just below the bar, this clamp being spiked or lag-screwed to the tie.

This improvement eliminates all danger of the rails pulling together and buckling the spreader bar if the post should receive an unusually heavy strain due to the high speed of cars hitting it.



The Improved Durable

The Mechanical Manufacturing Company UNION STOCK YARDS, CHICAGO

See the Improved Durable—Booths 245-248 at the Coliseum—March 7 to 10 inclusive.

Economical! Protection!



*A Mule-Hide Roof
for Every type of
building
Asbestos Shingles
too!*

**Long Wearing Performance
Explains low cost Maintenance**

Samples sent cheerfully

THE LEHON COMPANY
Manufacturers

44th to 45th St. on Oakley Ave.

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Any section gang can use **HEADLEY NO. 1**

THIS standard and original Emulsion can be efficiently used by any section gang for it is prepared ready for use upon arrival. There are many other advantages as for instance it can be used with wet or dry aggregate — can be placed in holes where the water has just been removed and when mixed with mineral aggregate, it mechanically separates allowing the patch to harden at the bottom as well as the top.

NO heaving by frost, dirt or sun. Develops a waterproof surface. Smooth surface insures safety. Lower in cost. Longer in wear.



Headley Good Roads Company

Franklin Trust Building

Philadelphia

Pa.

See Our Exhibit at the Show



Holmes Self-Boring Screw Spikes increase the life and efficiency of the tie.

Designed to overcome all defects of other rail fasteners.

When you use this Spike you will appreciate its wonderful advantages.

Have One Man do Work of a gang.

Write Us About Self-Boring Lag Screws for Signal Work, Tie Plates, Bridge and Crossing Timbers.

**The Malleable
Screw Products Co., Inc.**
Cincinnati, Ohio

HUNT

Special  Inspection

of Rails

Is Used By

More Than Half

of the

Railway Mileage

of the

United States

Robert W. Hunt Co.

Engineers

2200 Insurance Exchange, Chicago

WM.  JR. & INC.
CO.

Tisco Manganese Steel, introduced by Wharton in steam railroad trackwork in 1900, is still used by the leading railroads of the country, the quality having kept pace with the increased demands.

Plant: Easton, Pa.

Classified Advertisements

Use this section when seeking a new man, a new position, or when buying or selling second-hand equipment.

CLASSIFIED ADVERTISEMENTS, \$6.00 an inch, one inch deep by three inches wide an insertion.

EMPLOYMENT ADVERTISEMENTS, 5 cents a word a month, minimum charge \$1.00.

Remittance must accompany each order.

Railway Engineering and Maintenance

Classified Department

608 South Dearborn Street, Chicago

An old line manufacturer will divide profits with live agents with records, acquainted with M. W. officials in all railroad centers. Address Box 271, Railway Engineering and Maintenance, 30 Church Street, New York City.

UNIVERSAL POWER CAR

FOR MAINTENANCE-OF-WAY FORCES



TYPE A

Takes the men to the job and works when it gets there

A GAS-ELECTRIC POWER PLANT

Develops 110 volts a.c. and d.c. current for operating all Electric Tools such as Grinding Tools, Portable Rail Saws, Track and Bonding Drills, Electric Tie Tampers, Flood Lighting Systems, Portable Saws and Boring Tools for Carpenters and Bridge Gangs, Electric Driven Air Compressors for Sand-Blasting and Paint Spraying, and all other Electric Tools Essential to maintenance work.

DEPENDABLE—ECONOMICAL—FLEXIBLE

CAN BE OPERATED BY UNSKILLED WORKMEN

Electrically Driven, No Friction Discs, Gear Shifts or Clutches
Four men Can Easily Remove Car from Tracks

THE EUCLID ELECTRIC & MFG. CO.
EUCLID, OHIO

Save Old Switch Points!

Let us explain our new method of reclaiming worn switch points, sending them back into service to last longer than new ones. A practical economy you should not overlook.

"Tym-Ber-Slab" Grade Crossings

are proving the most practical of any type now in use.

They last longer. - Smoother.

Quickly installed.

Remove and replace without damage.

Cost no more.

They are perfection.

Write us.

INTER-STATE CAR AND FOUNDRY CO.
INDIANAPOLIS, INDIANA

Their extensive use makes them standard

Genasco Asphaltic Protective Products are used regularly by the leading railway systems throughout the United States. Their long wearing qualities are recognized everywhere. In the list of Genasco products below, check those about which you'd like to have full information, and write us.

Genasco Ready Roofing
(Smooth and Slate Surface)
Genasco Sealbac Shingles
(Individual and Strip)
Genasco Latite Shingles
Genasco Standard Trinidad
Built-up Roofing
Genasco Membrane Water-
proofing
Genasco Waterproofing
Asphalts
Genasco Waterproofing Felts
Genasco Asphalt Pipe Coating
Genasco Rustless Slushing
Compound
Genasco Asphalt Mastic
Flooring
Genasco Asphalt Fibre Coating
Genasco Liquid Asphalt Roof
Coating
Genasco Industrial Paint

Genasco Battery Seal Asphalt
Genasco Battery Paint
Genasco Asphalt Putty
Genasco Acid-Proof Paint
Genasco Asphalt Saturated
Felt
Genasco Deadening Felt
Genasco Insulating Paper
Genasco Red Sheathing Paper
Genasco Stringed Felt
Barber Brand Cold Repair
Cement
(for more permanent cross-
ings than wooden planks
and for platform construc-
tion)
Genasco Acid-Proof Mastic
Genasco Insulating Asphalt
(for use in Box Car Con-
struction)

THE BARBER ASPHALT COMPANY

1600 Arch Street, Philadelphia

New York Chicago Pittsburgh St. Louis Kansas City San Francisco

DIXON'S Silica-Graphite Paint

1827

1927

100th
Anni-
versary

Consider the high cost of repainting when specifying paint and use one that will not have to be renewed in a few years.

The Dixon Line of Graphite paints is one that will fully meet your requirements as to long-life and economy. They will give better protection for exposed metal or wood work at lowest cost per year of service.

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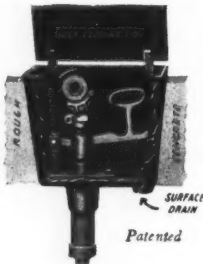
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Therefore it is especially important to use a valve that is positive in closing—that cannot be left partly open—that will not leak.

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We make LIME-SODA WATER SOFTENERS of both the ground operated and top operated types to purify water for prevention of scale deposits and corrosion in locomotive boilers.

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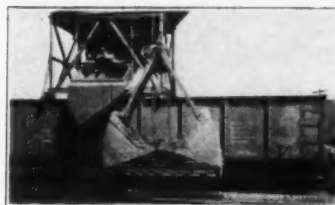
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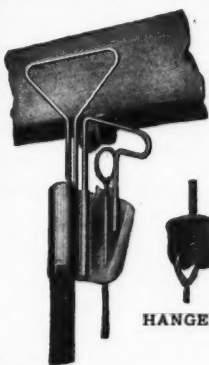


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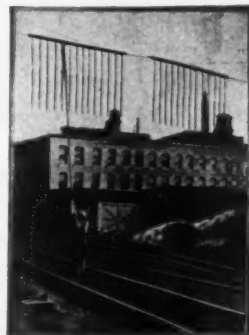
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No more tangling of tell-tales.

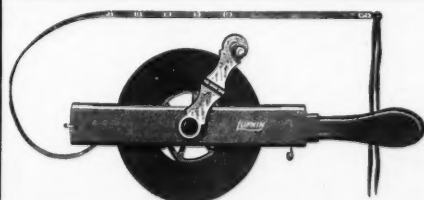
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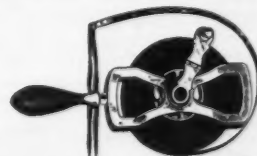
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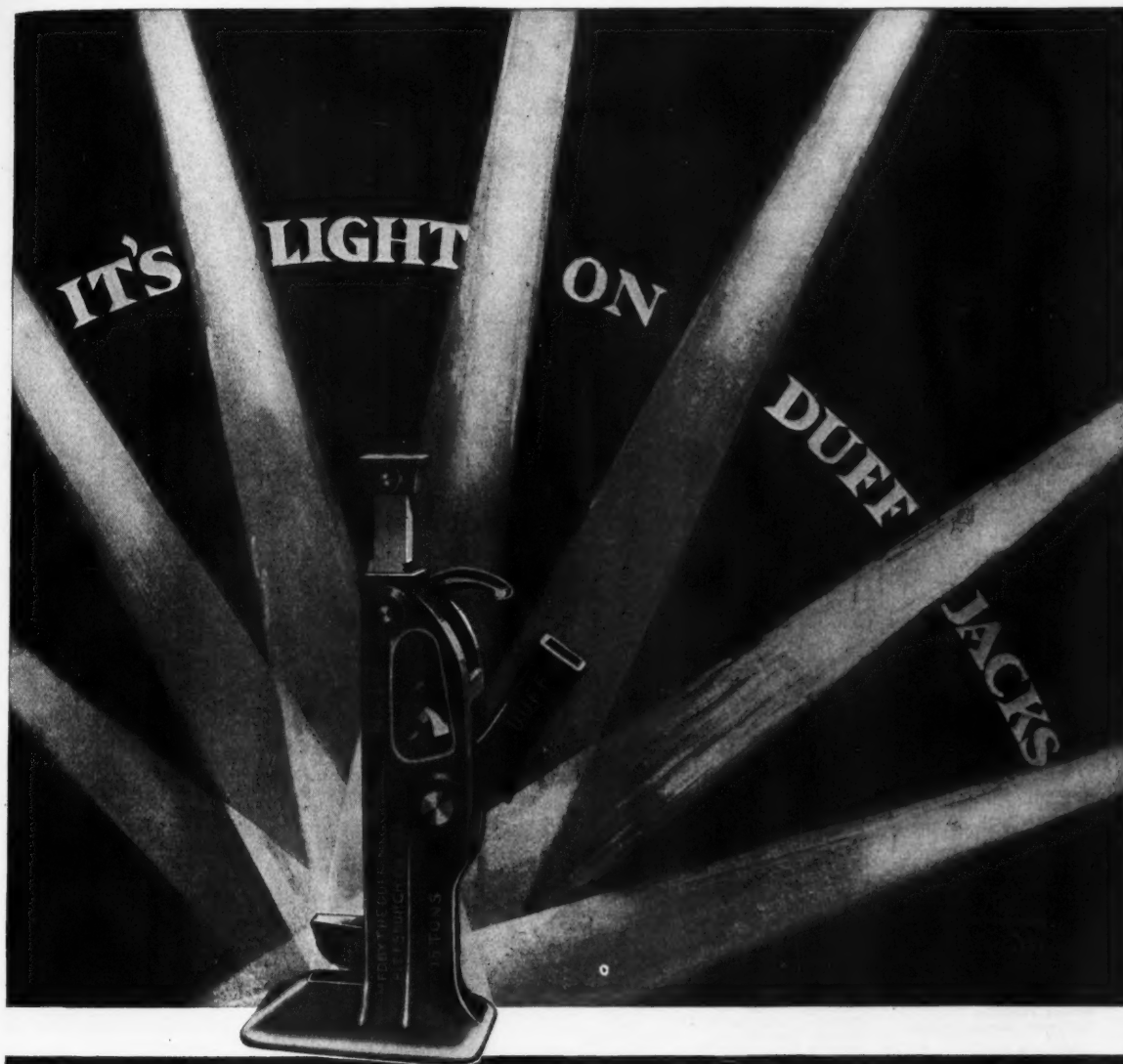
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Slabs, Concrete
Massey Concrete Products Corp.

Smoke Stacks
Massey Concrete Products Corp.

Snow Melting Devices
Q & C Co.

Snow Plows
Jordan Co., O. F.
Q & C Co.

Spike Pullers
Louisville Frog & Switch Co., Inc.

Spikes
Bethlehem Steel Co.
Inland Steel Co.

Spreader Cars
See Cars, Spreader

Spreaders, Ballast
See Ballast Spreaders

Standpipes (Penstock)
Fairbanks, Morse & Co.

Stands, Switch & Target
Bethlehem Steel Co.
Q & C Co.
Ramapo Ajax Corp.

Steel, Alloy
Central Alloy Steel Corp.

Steel Plates and Shapes
Bethlehem Steel Co.

Step Joints
See Joints, Step

Storage Tanks
Pittsburgh Des Moines Co.

Structural Steel
Bethlehem Steel Co.
Inland Steel Co.

Switches
Bethlehem Steel Co.
Buda Company
Interstate Car & Foundry Co.
Louisville Frog & Switch Co., Inc.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Switchmen's Houses
Massey Concrete Products Corp.

Switchpoint Protector
Fleming Co.

Switchstands & Fixtures
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Tampers, Tie
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Tank Fixtures
Fairbanks, Morse & Co.

Tanks, Steel
Pittsburgh Des Moines Co.

Tape, Insulating
Johns-Manville Corp.

Tapes, Measuring
Lufkin Rule Co.

Tee Rails
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Telephone Service, Long Distance
American Telephone & Telegraph Co.

Telegraph Poles
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Telegraph Service, Long Distance
American Telephone & Telegraph Co.

Telltails
Hastings Signal & Equipment Co.

Testing of Materials
Hunt Co., Robert W.

Thawing Outfits
Q & C Co.

Thermit Welding
Metal & Thermit Corp.

Ties
International Creosoting & Construction Co.

Tie Plates
Bethlehem Steel Co.
Inland Steel Co.
Lundie Engineering Corp.
Sellers Manufacturing Co.

Tie Plate Clamps
Q & C Co.

Tie Rods
Bethlehem Steel Co.

Tie Spacers
Duff Manufacturing Co.
Maintenance Equipment Co.

Tie Tampers
Electric Tapper & Equipment Co.
Ingersoll-Rand Co.
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Timber, Bridge
Interstate Car & Foundry Co.

Timber, Crossed
International Creosoting & Construction Co.

Timber, Slab
Interstate Car & Foundry Co.

Tile, Roofing
Federal Cement Tile Co.

Tools, Oxy-Acetylene Cutting & Welding
Oxwell Railroad Service Co.

Tools, Pneumatic
Ingersoll-Rand Co.

Tools, Track
Ames Shovel & Tool Co.
Buda Co.
Maintenance Equip. Co.
Q & C Co.
Verona Tool Works
Warren Tool & Forge Co.
Woodings Forge & Tool Co.

Tongue Switches
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. Co., Wm.

Torches, Oxy-Acetylene Cutting & Welding
Oxwell Railroad Service Co.

Track Drills
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Track Gages
Buda Co.
Kalamazoo Railway Supply Co.
Louisville Frog & Switch Co., Inc.

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Track Liners
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Track, Portable
Western Wheeled Scraper Co.

Track Tools
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Treating Plants, Water
American Water Softener Co.

Trestle Slabs
Massey Concrete Products Corp.

Tunnel Warnings
Hastings Signal & Equipment Co.

Ventilators
Johns-Manville Corp.

Warning Devices, Bridge & Tunnel
Hastings Signal & Equipment Co.

Water Softening Plants
American Water Softening Co.

Water Supply Contractors
Layne & Bowler Mfg. Co.

Water Tanks
Pittsburgh Des Moines Co.

Water Treating Plants
American Water Softening Co.

Waterproofing Fabrics
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Johns-Manville Corp.
Lehon Co.

Weed Burner
Dean-Williams Weed Destroyer Co.
Wooling Machine Co.

Weed Killer
Chipman Chemical Engineering Co., Inc.
Dean-Williams Weed Destroyer Co.
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Carbic Manufacturing Co.
Metal & Thermit Corp.
Oxwell Railroad Service Co.

Welding & Cutting Equipment
Carbic Manufacturing Co.
Oxwell Railroad Service Co.

Well Systems
Layne & Bowler Mfg. Co.

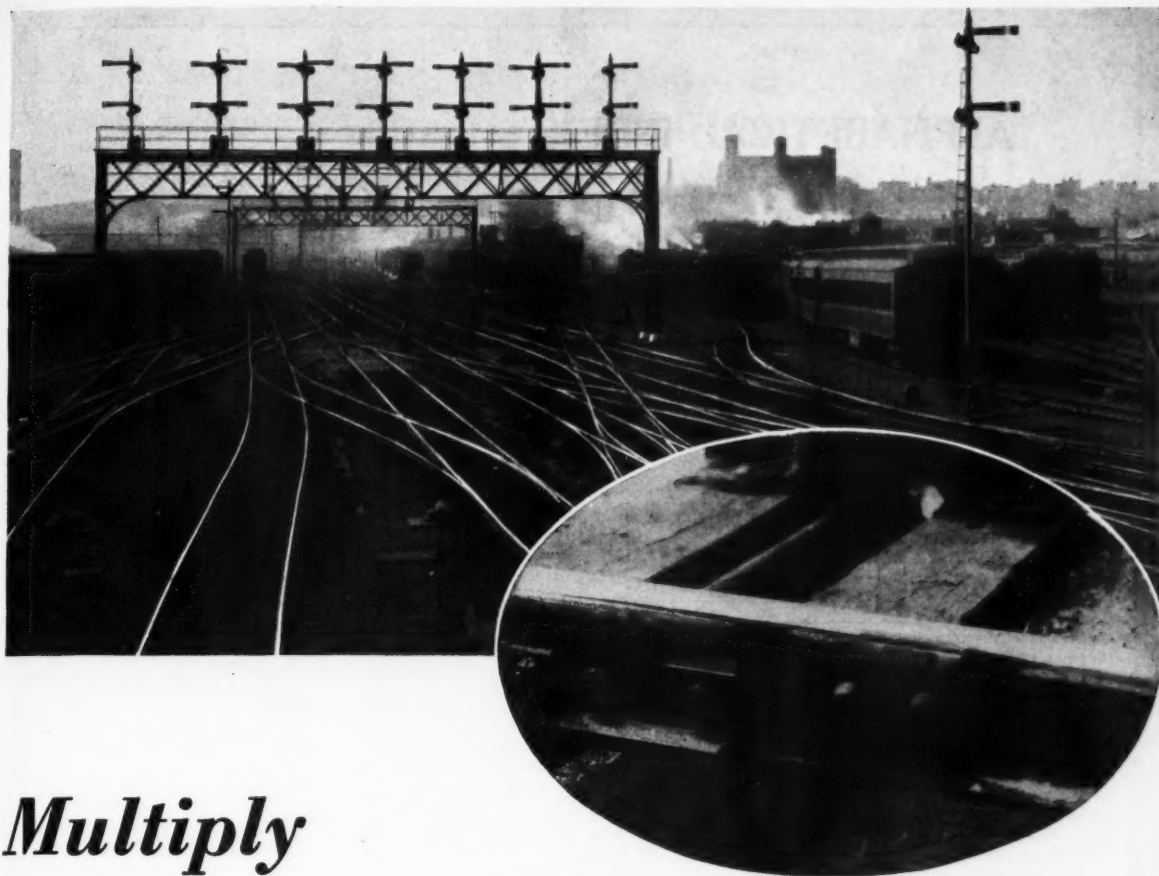
Wheels, Hand & Motor Car
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Windshields
Mudge & Co.
Fairbanks, Morse & Co.

Wire Fencing
Cyclone Fence Co.
Page Fence Association

Wood Preservation
See Preservation, Timber

Woodworking Machinery
American Saw Mill Machinery Co.



Multiply Switch Point Life

Mack Switch Point Protectors increase the life of switch points five to ten times.

They are extremely simple. Being reversible, they can be used on either side of the track or when one side becomes worn, they can be turned end for end and used over again.

Mack Switch Point Protectors cost but a fraction as much as one switch point—

BUT

There is no other appliance which offers such great proportionate maintenance economies.

If you are not now using *Mack* Switch Point Protectors, send us a description of rail used and let us send you a few for trial.

MACK

*Reversible
Switch Point*

PROTECTORS

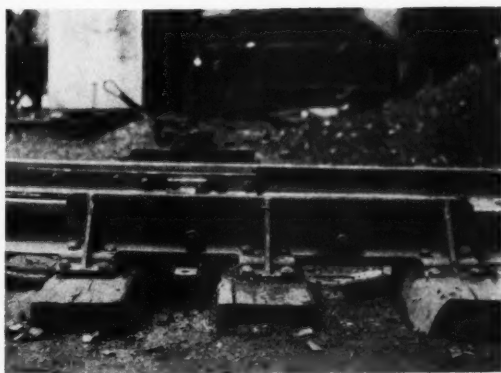
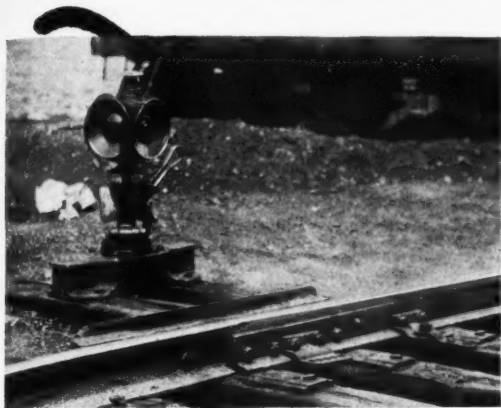
THE FLEMING COMPANY

Scranton

Penna.

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For those troublesome switches

Consider the many troublesome switches in your yards that are the cause of derailments and resulting in an enormous loss of both time and money over a short period.

The Q & C Switch Point Guard will positively eliminate this trouble; and further, will extend the life of your switch point many times. A comparison between the cost of one Q & C Switch Point Guard and that of one derailment will readily convince you of the efficient and economical value of this device.

We will be glad to give you full information on the Q & C Switch Point Guard during the March Convention at booths 120-139.

The Q & C Company

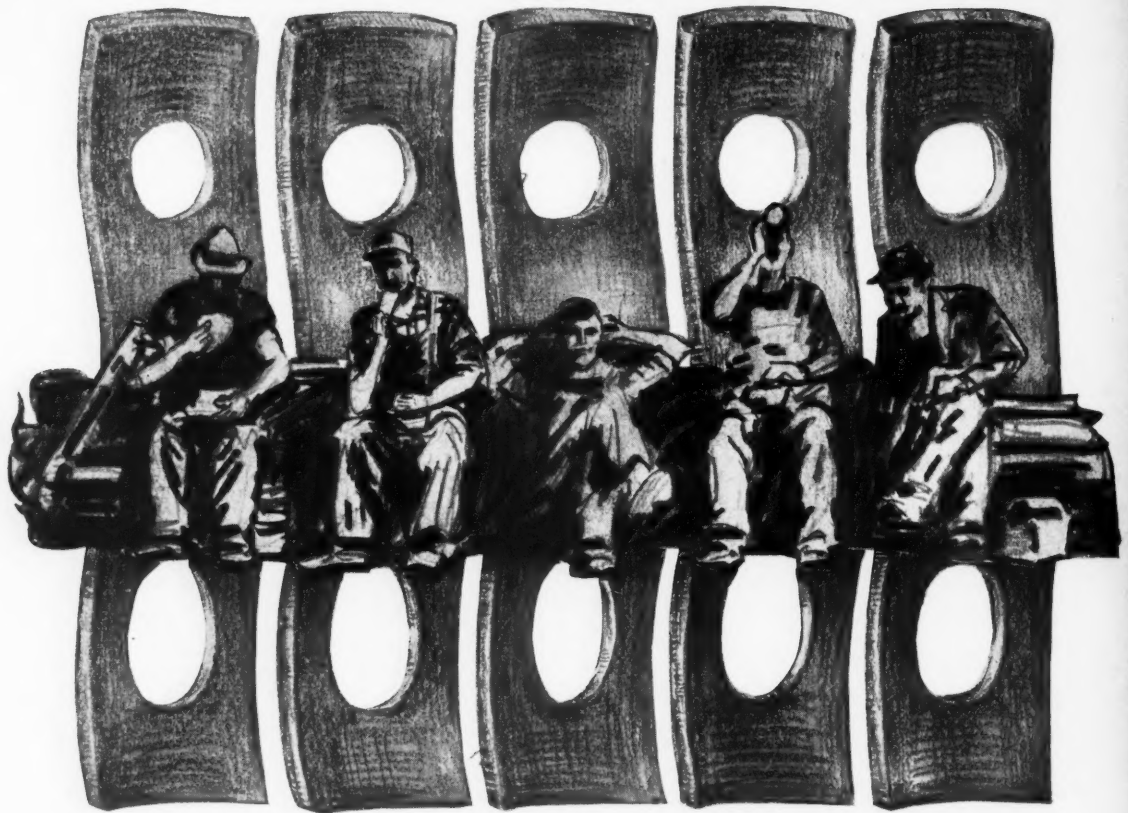
90 West St., N. Y.

Chicago

St. Louis



*Where can we save
you time and money
by eliminating
derailments?*



Springs or Men—Which?



To keep your rail joint bolts tight, you must use either Verona Rail Joint Springs or—men.

There is no other alternative.

Springs do not take out time for lunch. They never loaf on the job. They do not stretch the bolts by over-tightening. They do not line up periodically at the pay car. They do not need to be guarded with a red flag and a whistle, nor insured under a workmen's compensation act.

They work twenty-four hours a day, seven days a week, fifty-two weeks a year. They compensate instantly for the causes of loose bolts—stretch, rust, corrosion, and wear.

Verona Rail Joint Springs make bolts tight and keep them tight, more surely, and far more cheaply, than the most efficient track men.

VERONA TOOL WORKS . . . PITTSBURGH

